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ABSTRACT

The National Science Survey of Scientific Activities of Institutions of Higher Education, the subject of this report, is designed to provide national statistics that cast light on these issues. Through analyses of the data, a better picture is purported to be produced on the impact of Federal policy in support of scientific endeavors. The report shows that since 1973, increases in the growth in funding of academic research have been less than 3 percent per year. The report is divided into three main sections: (1) current research and development expenditures in the sciences and engineering; (2) capital expenditures for research, development, and instruction in the sciences and engineering; and (3) current direct expenditures for instruction and departmental research in graduate, degree-granting institutions in the sciences and engineering. Statistical tables show current research and development allocations according to: (1) source of funds, (2) distribution among fields of science, (3) type of activity, (4) type of control, (5) type of institution, (6) geographical distribution, and (7) expenditures. Details regarding scope, coverage, methods of estimating, and limitations of the data are presented in the technical notes in the appendices. (Author/EB)

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Surveys of Science Resources Series
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HIGHLIGHTS		
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Expenditures for Scientific and Engineering Activities at Universities and Colleges, Fiscal Year 1974

Surveys of Science Resources Series
National Science Foundation
NSF 76-303

FOREWORD

Many economic and social forces have emerged that have a significant impact on academic research and graduate education. Prominent among these forces are the changing nature of the role that universities play in the Nation's R&D picture, reliance on Federal agencies as sources of support, and, in recent years, the financial distress facing institutions resulting from declining rates of growth of research support and spiraling inflationary conditions.

From 1953, when the National Science Foundation (NSF) statistical series on academic R&D expenditures began, to the present, the proportion of U.S. research and development performed in universities and colleges nearly doubled. Throughout this period, the Nation has turned increasingly to its academic institutions for basic research. Today, more than one-half of the U.S. basic research is conducted in the academic sector, compared with about one-quarter in 1953. The main catalyst for this growth has been the Federal Government, which doubled its support of academic basic research in the last decade.

In recent years the growth in funding of academic research has slowed considerably. For more than a decade before 1969, annual increases were in double digits. Since 1973, however, increases have been less than 3 percent per year, as Federal support peaked and leveled off. These past two years saw actual declines in real terms with rates of inflation exceeding the growth of revenues. There are indications that in 1975, for the first time, the rate of inflation of academic R&D outstripped that for higher education in general since research requires heavier investment in capital equipment items and contracted services, items recently subject to higher price increases than salaries and wages.

The NSF Survey of Scientific Activities of Institutions of Higher Education, the subject of this report, is designed to provide national statistics that cast light on these issues. Through analysis of these data, a better picture is produced on the impact of Federal policy in support of scientific endeavors.

The report was prepared in the Division of Science Resources Studies, Charles E. Falk, Director.

H Guyford Stever, Director
National Science Foundation

January 1976

general notes

- The fiscal year 1974 NSF Survey of Scientific Activities of Institutions of Higher Education covered 603 academic institutions and 22 university-administered Federally Funded Research and Development Centers (FFRDC's). All institutions that grant doctorate or master's degrees in the sciences or engineering, or performed $50,000 or more separately budgeted research and development, were surveyed.
- Over 95 percent of the surveyed organizations returned usable questionnaires. All of the 100 largest R&D performers responded (accounting for 83 percent of all academic R&D expenditures). Estimates for nonrespondents were made by NSF with the imputation rate amounting to only 0.9 percent of the R&D total. Thus, figures shown in this report represent universe totals of scientific and engineering disciplines.
- R&D expenditure data presented in this report refer to *separately budgeted* research and development in the sciences and engineering and exclude departmental research expenditures which are analyzed separately as part of the instructional programs of universities and colleges. Excluded is research performed in the arts and humanities.
- Separately budgeted research and development includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution.
- Departmental research (nonsponsored research) is "personal" or "faculty" research supported by general funds of the department as a specifically assigned, departmentally planned, or mutually understood part of the faculty member's total activity.
- "Current expenditures" includes all expenditures made by the institution during the reporting period (fiscal year beginning July 1, 1973, and ending June 30, 1974, or the institution's equivalent accounting period) from both the unrestricted current fund and the restricted current funds. Included are both direct and indirect cost. Direct costs include the salaries and wages of those working on a research project, expenditures for small equipment items, materials used, and other expenses specifically identified with the project. Indirect costs are those incurred by an institution in implementing and supporting the entire research project, including "unreimbursed indirect costs."
- The term "expenditures" differs from the Federal accounting term "obligations," which reflect actual awards of funds by the reporting agency during a fiscal year (July 1 to June 30) regardless of when these funds were actually spent by recipient institutions.
- Statistics shown in this report may not add to totals or subtotals because of rounding.
- All percentage changes in trend statistics represent compound annual rates.
- Unless constant dollars are specified, data shown in this report are in terms of current dollars.
- In the absence of a reliable R&D cost index, the gross national product (GNP) implicit price deflator was used to convert R&D expenditures to constant dollars. The GNP deflator includes the effects of the price changes of all goods and services in the economy and therefore can only approximate changes in costs of inputs specifically related to R&D performance.

acknowledgments

This report was prepared in the Division of Science Resources Studies' Universities and Nonprofit Institutions Studies Group by Ronald S. Biggar and James B. Hoehn. M. Marge Machen participated in the preparation of statistical material. The survey was conducted and the report written under the supervision of Richard M. Berry, Study Director. William L. Stewart, Head of the R&D Economic Studies Section, provided special guidance.

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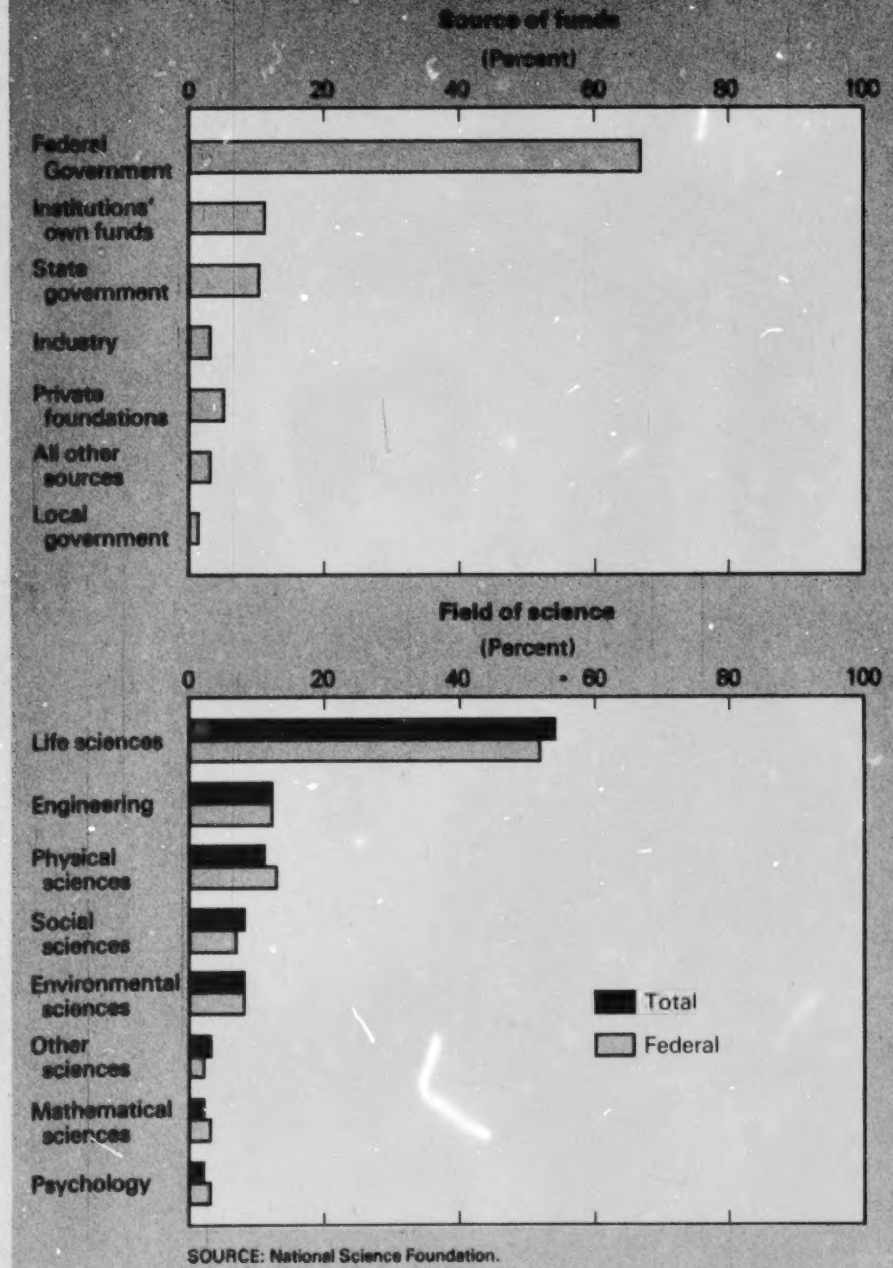
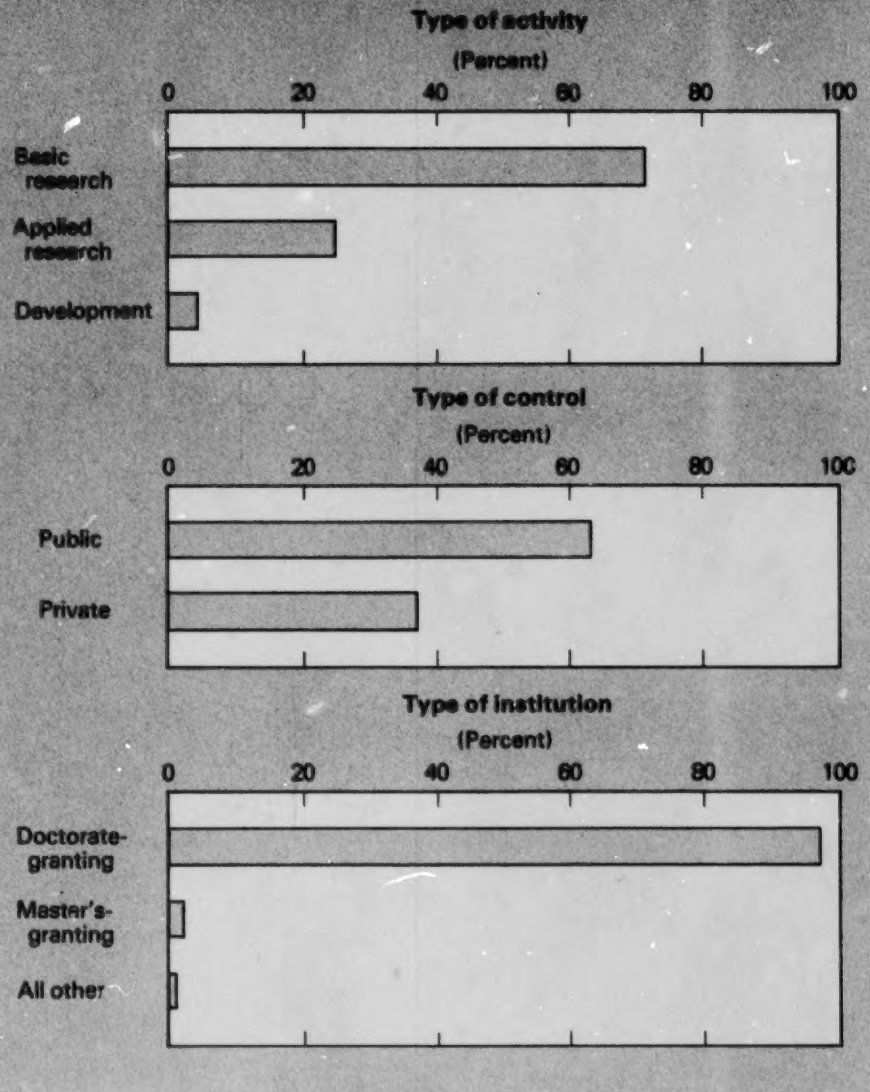
[1] See note on p. 21.

Characteristics of R&D expenditures in universities and colleges: FY 1974

Total $3,017





SOURCE: National Science Foundation.

HIGHLIGHTS

- Total R&D expenditures in the academic sector reached $3.0 billion in 1974, up nearly 3 percent over 1973; this growth rate is expected to continue through 1975. When measured in 1967 constant dollars, the 1974 total represents a 5-percent decline.
- A slight drop, less than one-half of 1 percent (8 percent in constant dollars) in Federal funding, which accounts for about two-thirds of the R&D expenditures in universities and colleges, was the major factor in this reduced rate of growth. In 1974 Federal funding for R&D activities in all sectors increased less than 3 percent (a 2-percent decrease in constant dollars).
- The separation of the Charles Stark Draper Laboratory from the academic sector into the independent nonprofit sector was a significant factor in the small increase in total R&D expenditures and the slight decline in Federal support.
- Between 1973 and 1974 basic research increased 5 percent to $2.1 billion, compared with a 2-percent decline in applied research and development. Between 1970 and 1973, however, basic research increased 5 percent per year while applied research and development increased 18 percent annually. In constant dollars 1974 basic research expenditures were 6 percent below 1972 funding levels.
- Although total R&D expenditures increased at an average annual rate of 9 percent during the decade ending in 1974, this rate of growth varied significantly among fields of science. R&D expenditures in the environmental sciences increases at the most rapid rate—16 percent per year, while the physical sciences increased at the slowest rate—5 percent annually.
- Between 1968 and 1974 R&D expenditures of publicly controlled academic institutions increased 8 percent per year, compared with a 3-percent annual increase in private institutions. The share of academic research and development performed by private universities and colleges dropped from 43 percent in 1968 to 37 percent in 1974.
- The top 100 universities, in terms of R&D funds, accounted for 83 percent of both total and Federal R&D funds in the academic sector in 1974. This share dropped steadily since the high of 87 percent was recorded in 1966. The 20 largest R&D performers dropped from 46 percent of the academic sector's total in 1966 to 36 percent in 1974. The exclusion of Draper Laboratory from the academic sector in 1974 accounts for a 2 percentage point reduction in the concentration of R&D expenditures among the top 100 institutions.
- Institutions granting doctorate degrees accounted for 97 percent of current R&D expenditures in 1974. This percentage has remained constant for the last 10 years.
- Capital expenditures for scientific activities in universities and colleges totaled $837 million in 1974, 22 percent below the $1.1 billion spent in the peak year of 1968. Since 1968, Federal funds used for capital purchases declined 33 percent, from $340 million to $228 million in 1974.
- R&D expenditures in university-administered Federally Funded Research and Development Centers (FFRDC's) totaled $865 million in 1974, up 6 percent over the $817 million expended in 1973. Most of the increases came in the physical sciences and engineering which together accounted for 83 percent of all R&D activities in FFRDC's during 1974.

INTRODUCTION

The National Science Foundation serves as the national statistical center for data on scientific R&D resources covering the four major sectors of the economy: (1) Federal agencies; (2) private industrial firms; (3) colleges and universities; and (4) independent nonprofit organizations. This report deals exclusively with R&D expenditures of U.S. institutions of higher education and presents the results of the Survey of Scientific Activities of Institutions of Higher Education, FY 1974. This survey series was instituted in 1954 to obtain statistical information on science and technology activities of universities and colleges. Detailed statistical tables based on the 1974 survey results were published in advance of this report in order to provide timely data for interested users.[1]

The following principal characteristics of R&D expenditures are examined in this report: Source of funds; distribution among fields of science; and type of R&D activity (basic research, applied research, and development). Institutions are grouped by highest degree granted, type of control (public, private, etc.), and ranked by total and Federal R&D expenditure size, with subtotals for every 10 institutions. Separate data are summarized for FFRDC's administered by universities and colleges. Also included are separate chapters dealing with capital expenditures and instruction and departmental research in the sciences and engineering. Details regarding scope, coverage, methods of estimating, and limitations of the data are presented in the technical notes in appendix A.

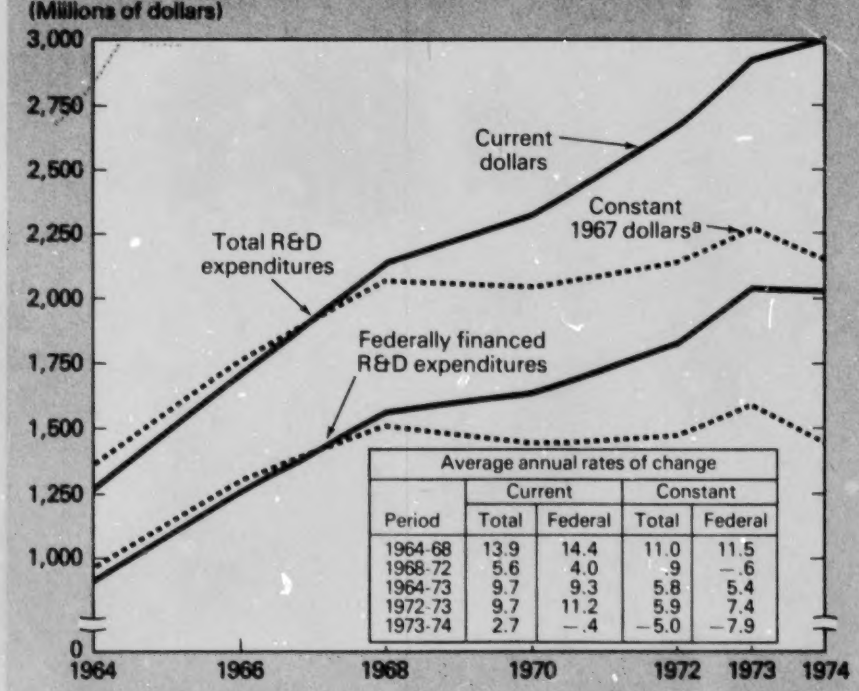
[1] National Science Foundation, *Detailed Statistical Tables. Expenditures for Scientific and Engineering Activities at Universities and Colleges, Fiscal Year 1974* (NSF 75-318), 1975; and *Science Resources Studies Highlights*, "Separately Budgeted Academic R&D Expenditures Decline in Real Terms in FY 1974," April 21, 1975 (Washington, D.C. 20550).

Part I
UNIVERSITIES AND COLLEGES

The Nation's universities and colleges reported $3 billion in current R&D expenditures for 1974, or 9 percent of the estimated total research and development conducted by all sectors of the economy. Although this percentage has doubled over the last 20 years, the 3-percent annual growth between 1973 and 1974 marks a considerable slowdown from the 10-percent annual growth rate reported in the 1964-73 period. Two significant factors contributed to the small increase in R&D expenditures in the 1973-74 period: (1) a leveling off of Federal R&D support to the academic sector in 1973 and (2) a reclassification of Draper Laboratory, formerly part of the Massachusetts Institute of Technology (MIT) into an independent nonprofit corporation, resulting in a $55 million decline in academic R&D expenditures. Based on NSF projections, another small increase of about 3 percent is expected in 1975, largely because of the leveling off of Federal support.[2]

Measured in terms of constant 1967 dollars, R&D expenditures in the academic sector declined 5 percent between 1973 and 1974, when the national rate of inflation was 8 percent. As a result, in actual terms, the total 1974 R&D effort is only 4 percent above 1968 expenditure levels compared with 10 percent in 1973. Federally financed R&D expenditures are 4 percent below 1968 levels when converted to constant dollars.

R&D expenditures in the sciences and engineering at universities and colleges: FY 1964-74



Average annual rates of change				
	Current		Constant	
Period	Total	Federal	Total	Federal
1964-68	13.9	14.4	11.0	11.5
1968-72	5.6	4.0	.9	−.6
1964-73	9.7	9.3	5.8	5.4
1972-73	9.7	11.2	5.9	7.4
1973-74	2.7	−.4	−5.0	−7.9

[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

[2] See National Science Foundation, *National Patterns of R&D Resources: Funds & Manpower in the United States, 1953-1975* (NSF 75-307) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office), 1975.

Revenues from extramural sources support nine-tenths of all expenditures for R&D performance in universities and colleges. The Federal Government provided $2 billion, or 67 percent, of all academic R&D expenditures in 1974, down from the 74-percent peak recorded in 1966. Reduced growth in R&D funding from Federal agencies, up only 1 percent between 1972 and 1973,[1] and the reclassification of Draper Laboratory in 1974, have resulted in zero growth in federally financed R&D expenditures.

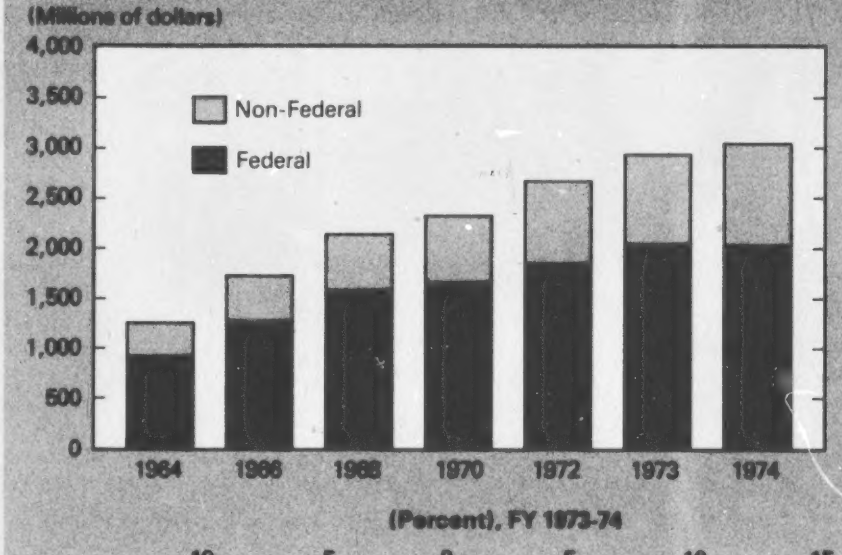
State and local government R&D support combined increased from $172 million, or a low of 8 percent of the R&D total in 1968, to a high of 11 percent, or $329 million in 1974. R&D support from industry, although accounting for only 3 percent of the academic total, increased from $86 million to $96 million between 1973 and 1974, the fastest rate of any funding source—12 percent.

Institutional funds that universities and colleges were free to designate for research and development amounted to $340 million in 1974—up 8 percent over the $314 million reported in 1973. In the 1964-74 decade institutional funds have increased from a low of 8 percent in 1964 to 11 percent of all academic R&D funding in 1974.

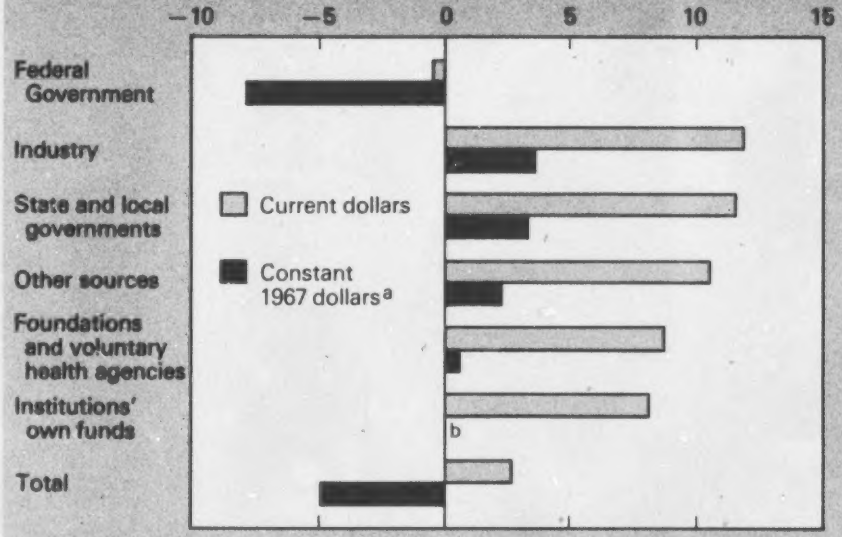
In the 1964-74 decade federally financed R&D expenditures dropped from a high of 74 percent of all academic R&D expenditures in 1966 to a low of 67 percent in 1974. Reduced growth in federally financed R&D expenditures and greater reliance on industry and State governments as sources of R&D funding has increased the non-Federal share of academic research to a high of 33 percent in 1974.

[1] See National Science Foundation, *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1973* (NSF 75-304) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office), 1975.

R&D expenditures in the sciences and engineering at universities and colleges, by source: FY 1964-74



(Percent), FY 1973-74

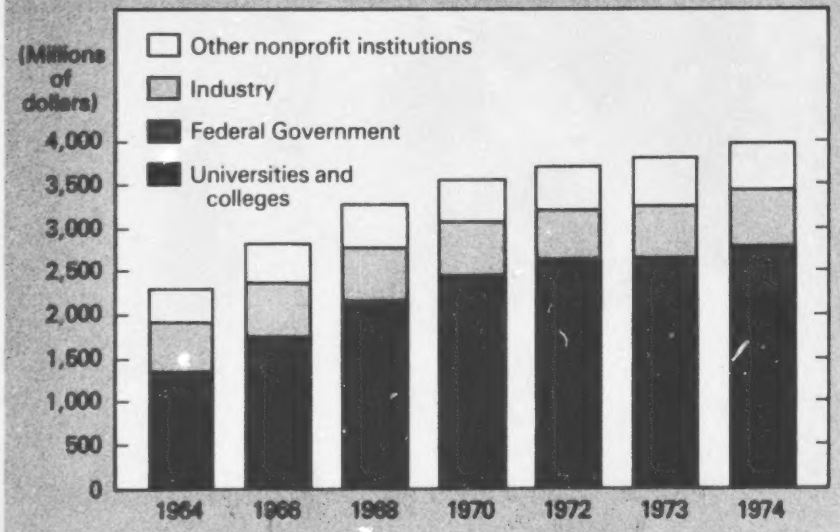


[a]Based on GNP implicit price deflator.
[b]Less than +0.5 percent.
SOURCE: National Science Foundation.

The share of total U.S. basic research expenditures performed by the academic sector increased significantly in the 1964-74 decade. Universities and colleges, the performers of the largest amount of basic research, increased their share from 44 percent to 54 percent, while industry's share dropped from 24 percent to 16 percent. The Federal Government's and other nonprofit institutions' shares ranged between 14 percent and 16 percent in every year except 1970 when the Federal share peaked at 18 percent.

In 1974 universities and colleges expended $2.1 billion for basic research, double the $1 billion allocated in 1964. Between 1964 and 1970 basic research expenditures increased at an average of 10 percent annually, then slowed to a 2-percent annual growth rate from 1970 to 1974. In constant dollars, 1974 basic research expenditures were 3 percent below 1968 funding levels.

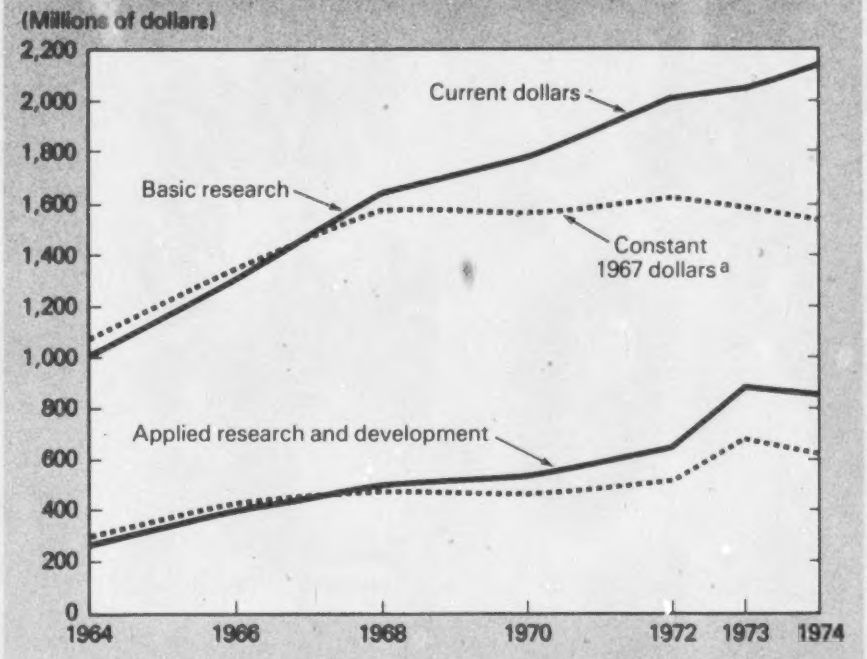
Total basic research expenditures in all sectors of the economy by performer: FY 1964-74



SOURCE: National Science Foundation.

Applied research totaled $741 million in 1974, up 4 percent from 1973, following a 31-percent rise between 1972 and 1973. Development, however, declined 25 percent in the 1973-74 period to $126 million. The reclassification of Draper Laboratory, heavily engaged in development projects (over 65 percent), accounted for most of the decline.

Current R&D expenditures in the sciences and engineering at universities and colleges, by character of work: FY 1964-74



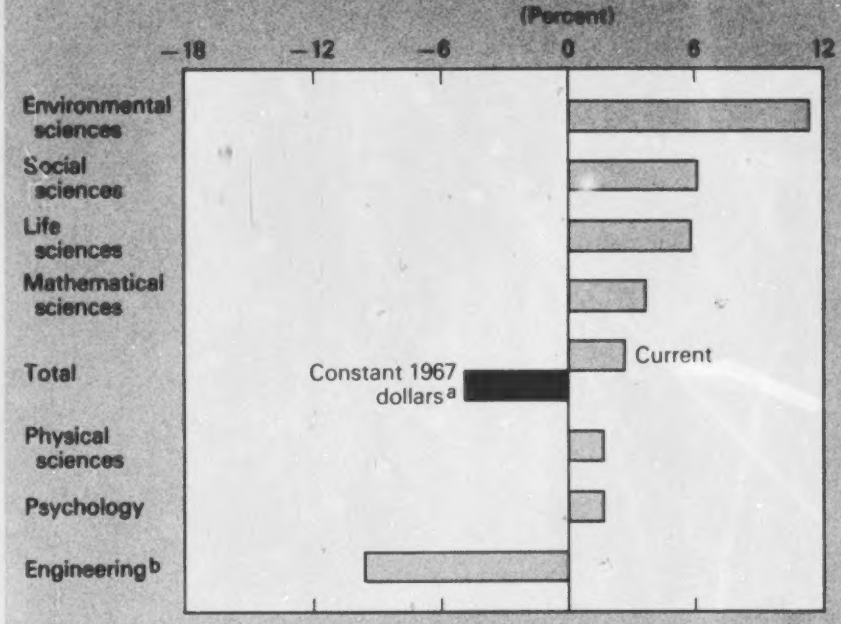
[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

BROAD AREAS

Between 1973 and 1974 R&D expenditures increased in every *major* science area except engineering. The life sciences (including biological and clinical medical sciences) rose the largest absolute amount from $1.5 billion in 1973 to $1.6 billion in 1974, or 6 percent. The environmental sciences showed the largest percentage gain, 11 percent, while psychology recorded the smallest rate of increase, 2 percent. Engineering expenditures declined 10 percent, primarily because of the reclassification of Draper Laboratory.

In the 1973-74 period, the pattern of federally financed R&D support among the major science areas fluctuated significantly. Moderate increases ranging from 2 percent in the social sciences to 6 percent in the environmental sciences were offset by declines of as much as 17 percent in engineering and 18 percent in "other sciences." The net effect was a decline of less than one-half of 1 percent in total federally financed R&D expenditures.

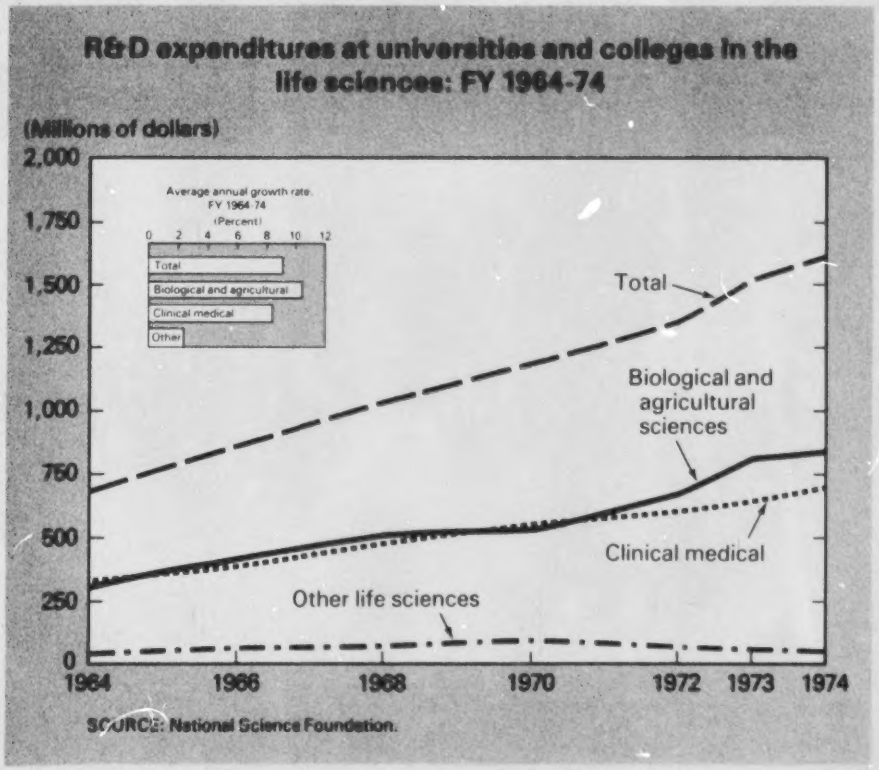
Percent change in R&D expenditures at universities and colleges, by field of science: FY 1973-74



[a]Based on GNP implicit price deflator.
[b]Draper Laboratory with an estimated $55 million in engineering R&D expenditures reclassified into the independent nonprofit sector in 1974.
SOURCE: National Science Foundation.

LIFE SCIENCES

R&D expenditures in the life sciences totaled $1.6 billion in 1974, or 54 percent of all academic research. Between 1964 and 1974 both life science R&D expenditures and total academic research increased at an average rate of 9 percent annually. Between 1972 and 1974, however, life science expenditures rose 9 percent annually, while total academic R&D expenditures increased only 6 percent.



Within the life sciences, clinical medical research accounted for $709 million, or 44 percent of the total in 1974. The biological sciences ranked next with 33 percent, followed by the agricultural sciences with 20 percent and all other life sciences with 4 percent. Between 1972 and 1974 the biological and agricultural sciences combined increased 12 percent per year, while the clinical medical sciences increased 8 percent annually.[4]

The federally financed share of life science expenditures remained relatively constant throughout the 1964-74 decade. The Federal share of 67 percent in 1964 increased to a high of 70 percent in 1968 before declining to 65 percent in 1974. Within the life sciences in 1974, the federally financed share ranged from 31 percent in the agricultural sciences to 76 percent in clinical medical research. The low proportion of federally financed agricultural research is due to the fact that most agricultural research is State supported and is performed in agricultural experiment stations located at State controlled academic institutions (table 1).

[4] Separate data for biological and agricultural sciences are available for the first time in 1974. Estimates for 1972 and 1973 were developed by NSF based on data reported in the survey in 1974 and secondary sources for earlier years.

Table 1. Trends in total and federally financed R&D expenditures in the life sciences at universities and colleges: selected years

[Dollars in thousands]

Fiscal year	Life sciences		Agricultural and biological sciences		Clinical medical		Other life sciences	
	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed
1964	$681,594	66.8	$315,471	56.1	$320,086	80.3	$46,037	46.1
1966	872,336	68.2	422,483	59.7	389,618	80.3	60,235	50.0
1968	1,037,031	69.9	490,607	62.5	477,346	80.0	69,078	53.0
1970	1,194,249	68.2	547,193	61.2	549,121	78.6	97,935	48.9
1972	1,352,601	65.4	682,296	58.6	604,987	74.2	65,318	54.4
1973	1,526,245	66.5	818,738	60.1	646,969	75.2	60,538	60.6
1974	1,616,337	65.1	849,241	55.4	709,395	76.1	57,701	73.2

SOURCE: National Science Foundation

PHYSICAL SCIENCES

Expenditures for research and development in the physical sciences totaled $339 million in 1974, or 11 percent of all academic research, down from 17 percent in 1964. The 5-percent annual rate of growth for all physical sciences and the 4-percent growth in physics alone from 1964 to 1974 were the slowest growth rates of any major fields of science.

Throughout the 1964-74 decade the physical sciences recorded the highest share of Federal support, ranging from a high of 86 percent in 1966 and steadily dropping to a low of 80 percent in 1974. Federally financed physical science expenditures increased at an average annual rate of 4 percent during this decade, far below that of any other science area (table 2).

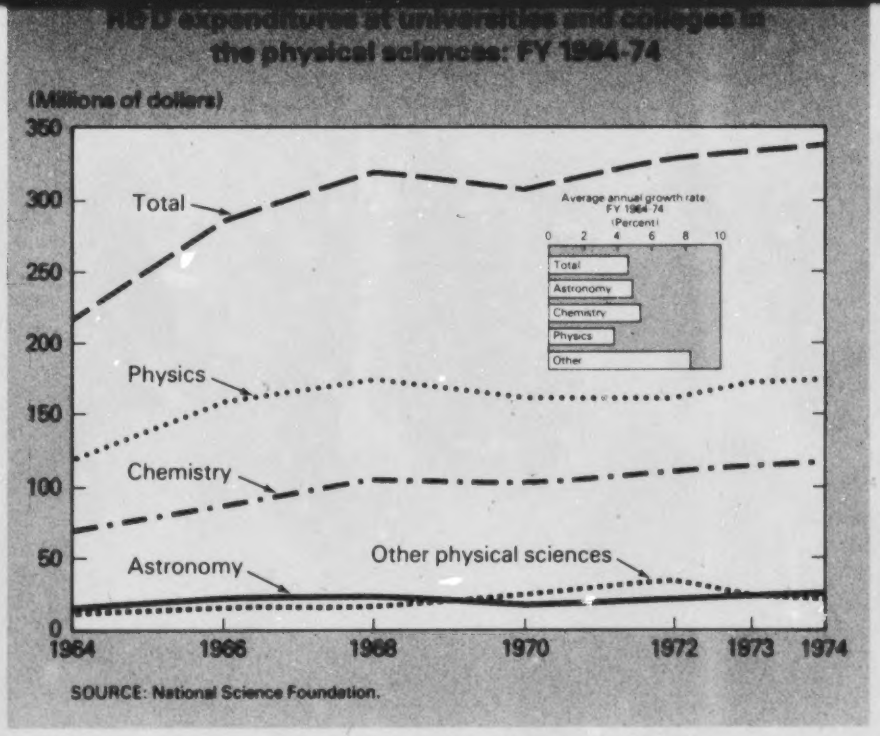


Table 2. Trends in total and federally financed R&D expenditures in the physical sciences at universities and colleges: selected years

[Dollars in thousands]

Fiscal year	Physical sciences		Astronomy		Chemistry		Physics		Other physical sciences	
	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed
1964	$216,989	86.4	$15,571	87.7	$70,022	79.1	$119,578	91.9	$11,818	71.6
1966	286,707	86.4	22,676	88.7	87,955	78.4	159,135	91.8	16,941	73.6
1968	319,739	85.4	24,103	87.5	104,695	79.0	172,660	90.5	18,281	71.4
1970	307,310	83.9	18,597	83.4	102,002	77.4	161,921	89.1	24,790	76.9
1972	329,900	81.1	21,974	76.7	110,015	76.9	161,853	86.3	36,058	73.0
1973	333,838	81.8	24,089	73.4	114,293	76.1	171,052	86.9	24,404	80.3
1974	339,435	80.0	24,840	70.0	117,479	75.3	173,232	85.5	23,884	73.1

SOURCE: National Science Foundation

SOCIAL SCIENCES

R&D expenditures in the social sciences accounted for $245 million, or 8 percent of all academic research in 1974, up from a 6-percent share in 1964 (chart 9). The 12-percent average annual growth rate sustained during this 10-year period was second only to the 15-percent annual rate recorded for the environmental sciences. The tripling of social science R&D expenditures since 1964 was primarily due to large increases in multidisciplinary social science research and research in education.

The federally financed share of social science R&D expenditures varied significantly in the 1964-74 decade. The Federal share increased from a low of 52 percent in 1964 to a high of 60 percent in 1968 before dropping to 55 percent in 1974. Nearly two-thirds of all sociology research was federally financed, while Federal support in political science and economics was 42 percent and 45 percent, respectively (table 3).

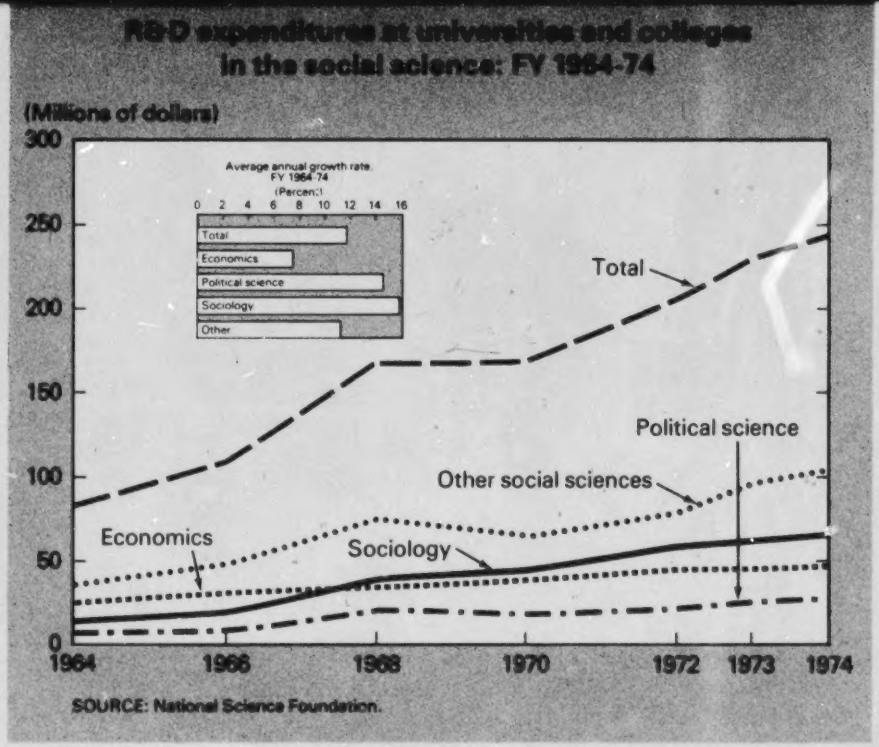


Table 3. Trends in total and federally financed R&D expenditures in the social sciences at universities and colleges: selected years

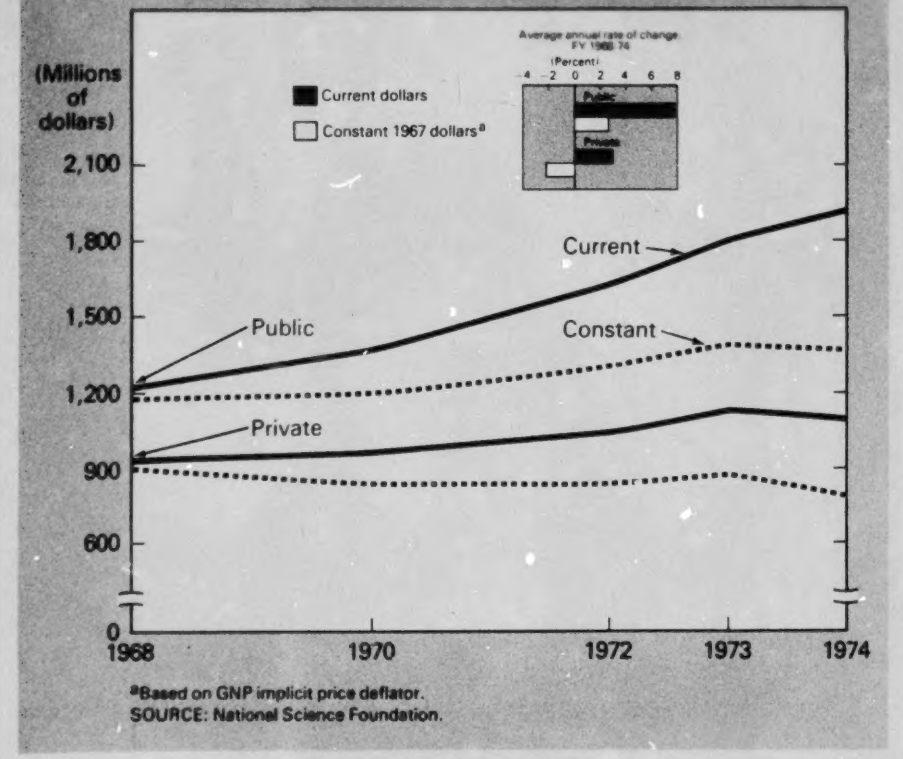
[Dollars in thousands]

Fiscal year	Social sciences		Economics		Political science		Sociology		Other social sciences	
	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed	Total	Percent federally financed
1964	$81,539	51.7	$24,068	43.9	$6,876	45.5	$14,664	59.6	$35,931	54.9
1966	109,279	56.7	31,695	49.0	8,979	51.2	20,000	64.2	48,605	59.6
1968	167,986	60.0	35,017	50.1	20,742	50.4	38,587	67.6	73,640	63.5
1970	168,669	56.1	38,616	45.8	19,273	41.1	44,383	59.1	66,397	64.5
1972	206,344	55.2	46,586	44.9	21,771	39.5	59,475	60.0	78,512	62.0
1973	231,181	57.5	47,037	48.5	25,525	40.6	61,652	66.4	96,967	60.6
1974	245,317	55.4	49,303	45.5	26,970	42.1	64,878	63.6	104,166	58.5

SOURCE: National Science Foundation

During 1973-74 R&D expenditures of publicly controlled universities and colleges increased 6 percent to $1.9 billion. Research and development in private institutions declined 3 percent, primarily because of the reclassification of Draper Laboratory. Between 1968 and 1974 public institutions maintained an 8-percent annual rate of growth in R&D expenditures, nearly triple the 3-percent growth achieved by private institutions. In 1974 private institutions accounted for 37 percent of all academic research, down from a 43-percent share in 1968.

R&D expenditures at universities and colleges, by type of control: FY 1968-74



[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

Federally funded R&D expenditures accounted for a decreasing share of the total in both public and private institutions (table 4). By 1974 the Federal Government supplied 78 percent of the R&D funds used by privately controlled institutions and 61 percent in public institutions, compared with 83 percent and 66 percent, respectively, in 1968. In the 1973-74 period Federal R&D expenditures in public institutions increased 3 percent compared with a 4-percent decline in private institutions (because of the reclassification of Draper Laboratory).

In 1974 public institutions, supported heavily by their respective State governments, spent $303 million for agricultural research performed primarily in agricultural experiment stations. Since most of agricultural research is performed in public, State supported institutions, private institutions spent only $21 million on agricultural research.

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Trends 4. Trends in total and federally financed R&D expenditures at universities and colleges, by type of control: selected years

[Dollars in thousands]

Fiscal year	Public institutions			Private institutions		
	Total	Federal	Percent federally financed	Total	Federal	Percent federally financed
1968	$1,217,519	$803,548	66.0	$931,189	$768,516	82.5
1970	1,367,812	869,049	63.5	967,047	778,451	80.5
1972	1,622,897	1,024,078	63.1	1,053,614	814,855	77.3
1973	1,801,641	1,143,747	63.5	1,135,066	897,748	79.1
1974	1,912,134	1,174,839	61.4	1,105,257	858,636	77.7

SOURCE: National Science Foundation

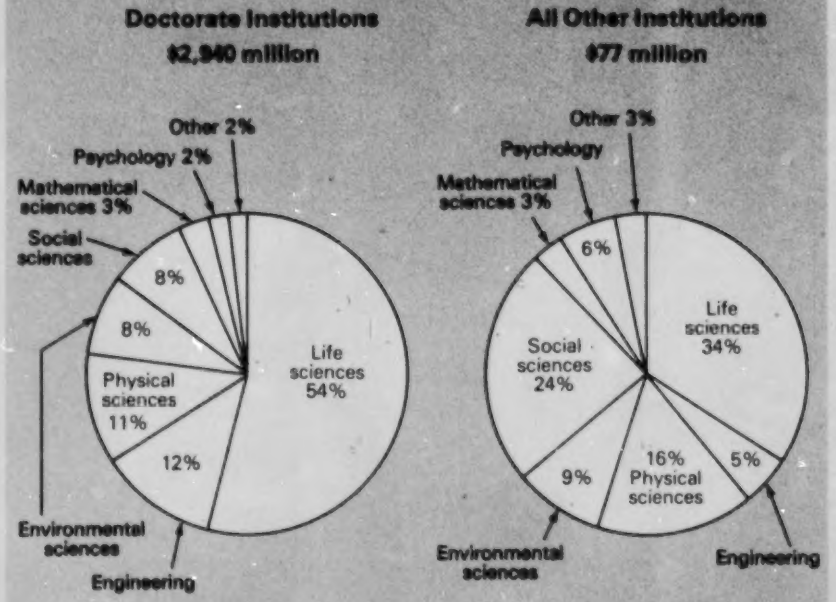
Because doctorate-granting institutions accounted for 97 percent of all R&D expenditures in the academic sector, the R&D expenditure characteristics of this group coincided closely with the overall pattern for all institutions. The dominant characteristics of nondoctorate-granting institutions are as follows:

(1) In the 1973-74 period research and development in master's-granting institutions increased 7 percent, while a 7-percent decline was registered in both bachelor's and nonscience degree-granting institutions.

(2) In all nondoctorate-granting institutions, the life sciences accounted for 34 percent of the R&D total, followed by the social sciences with 24 percent.

(3) Federally financed R&D expenditures amounted to 61 percent of the nondoctorate total. The Federal share, however, ranged from 56 percent in master's-granting institutions to 79 percent in institutions not granting science degrees.

Current R&D expenditures at universities and colleges, by field of science and type of institution: FY 1974



SOURCE: National Science Foundation.

The Middle Atlantic States consistently ranked first in academic R&D expenditures over the last decade. Their rate of growth during this period, however, was 8 percent per year compared to an 11-percent rate in the Pacific States and West South Central States. During 1973-74, the Middle Atlantic States, although still accounting for the largest amounts—$543 million—showed only a 2-percent growth rate. The New England States reflected a decline of 12 percent in academic R&D expenditures since Draper Laboratory in Massachusetts was reclassified into the independent nonprofit sector.

Table 5. Distribution of total R&D expenditures in the sciences and engineering at universities and colleges in 10 leading States: selected years

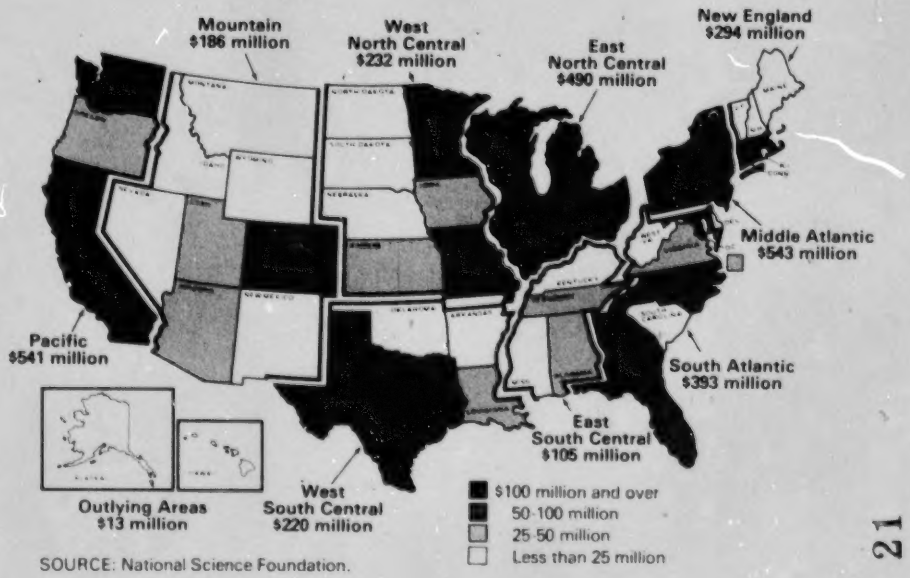
[Dollars in millions]

Top 10 States in R&D expenditures	1964	1966	1968	1970	1972	1973	1974	Percent change 1973-74
Total, all States	$1,275	$1,715	$2,149	$2,335	$2,677	$2,937	$3,017	2.7
	Percent distribution							
California	11.4	11.6	11.5	10.5	12.1	12.9	13.0	3.2
New York	11.7	12.1	12.4	11.7	11.5	11.9	11.4	-1.2
Massachusetts	8.0	8.9	8.7	8.7	8.8	8.3	[1]6.8	[1]-16.7
Texas	3.4	3.7	4.1	4.4	4.4	4.7	5.1	10.9
Pennsylvania	5.6	5.5	5.8	5.6	4.9	4.5	4.8	8.3
Illinois	6.1	5.4	5.1	4.5	4.6	4.5	4.7	6.8
Michigan	4.1	4.1	3.6	3.7	3.7	3.8	3.6	-3.6
Wisconsin	2.8	3.1	3.2	3.3	3.1	3.3	3.3	2.0
Ohio	3.1	3.0	3.2	3.1	2.7	2.6	2.7	6.5
North Carolina	2.1	2.3	2.6	2.5	2.4	2.7	2.6	-1.3
All other States[2]	41.8	40.4	39.9	42.0	41.8	40.7	42.1	6.5

[1] Excludes Draper Laboratory with $55 million in R&D expenditures. This institution is classified as part of the independent nonprofit sector in 1974.
[2] Includes outlying areas and offices abroad.

SOURCE: National Science Foundation

Geographic distribution of total R&D expenditures in the sciences and engineering at universities and colleges: FY 1974



SOURCE: National Science Foundation.

In 1974 California and New York together accounted for nearly one-fourth of all academic R&D expenditures. These two States plus five others—Massachusetts, Pennsylvania, Illinois, Michigan, and Texas, each with $100 million or more in R&D expenditures—accounted for one-half of all such expenditures in 1974 (table 5). In contrast, 21 States with less than $25 million in R&D expenditures accounted for only 9 percent of the academic total.

Since 1972 California moved ahead of New York as the leading State in terms of academic R&D expenditures. Massachusetts, although remaining third, declined in relative importance. In the 1973-74 period South Carolina reported the largest rate of increase—25 percent. Thirteen other States reported increases of at least 10 percent, while Massachusetts, New Hampshire, and Hawaii reported declines of more than 10 percent.

Since 1966, there has been a trend towards wider dispersion of R&D expenditures among academic institutions (table 6). The proportion of research performed by the top 20 institutions dropped steadily from a high of 41 percent of the total R&D expenditures in 1966 to 36 percent in 1974. Institutions in the 21 to 50 group and 51 to 100 group maintained a constant share of about 26 percent and 20 percent, respectively. The top 100 academic institutions accounted for 83 percent of both total and Federal R&D funding in 1974 after dropping from a high of 87 percent recorded in 1966. Smaller R&D performing institutions, outside of the top 100 grouping, increased their share of both total and Federal R&D expenditures from 12 percent in 1966 to 17 percent in 1974.

Between 1973 and 1974, 77 of the 100 largest R&D performers reported an increase in R&D expenditures and 36 of these reported increases of at least 10 percent. The 23 institutions that reported declines showed rates ranging from less than 1 percent to 15 percent (table B-3).[5] These same top 100 institutions show a much more neutral growth pattern when Federal R&D rates of change are analyzed. Only 59 institutions reported R&D increases with 22 showing increases of at least 10 percent. Forty institutions, however, reported declines in Federal R&D expenditures ranging from less than 1 percent to 20 percent.[5]

[5] This percentage excludes the Massachusetts Institute of Technology which dropped from $125 million in 1973 to $77 million in 1974 due to the reclassification of Draper Laboratory.

Table 6. Percent distribution of total and federally financed R&D expenditures grouped by universities and colleges with largest R&D programs: selected years

[Percent]

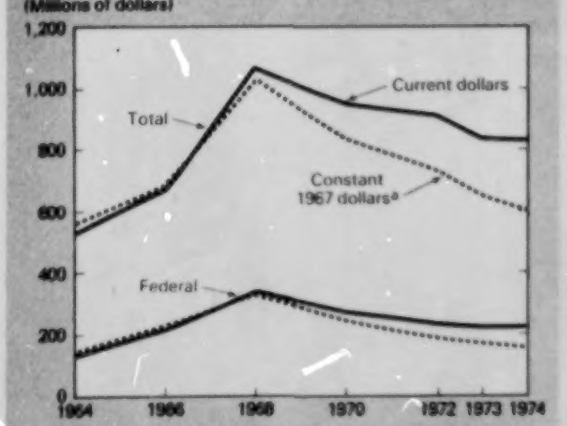
Institutional group	1966		1968		1970		1972		1973		1974	
	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
1-20	41	45	40	43	38	40	38	41	37	41	36	40
21-50	26	24	26	22	26	25	26	24	26	24	26	24
51-100	20	19	21	21	21	20	20	19	20	18	21	19
All other	12	12	14	14	16	15	17	16	17	17	17	17

SOURCE: National Science Foundation

Section 2. CAPITAL EXPENDITURES FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION IN THE SCIENCES AND ENGINEERING

During the period of expanding science enrollments and increasing levels of Federal support of research in the sixties, universities and colleges doubled their instruction and research facilities and equipment expenditures in the sciences from $529 million in 1964 to a high of $1.1 billion in 1968. Since 1968, however, declining graduate science enrollments (3-percent decline from 1970 to 1973), increasing interest rates, and reduced Federal support have resulted in a steady decline (averaging 4 percent per year) in capital expenditures to $837 million in 1974. In constant dollars, capital expenditures have been decreasing at an annual rate of 9 percent per year since 1968.

Capital expenditures for research, development, and instruction in the sciences and engineering at universities and colleges: FY 1964-74

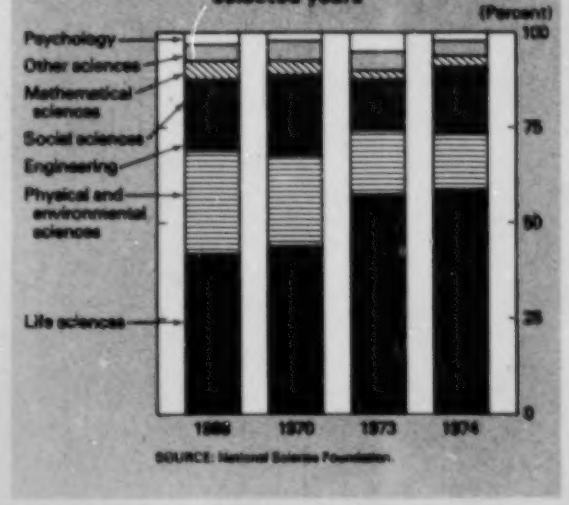


[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

Federally financed capital expenditures as a percent of the academic total ranged from a low of 25 percent in 1964 to a high of 32 percent in 1966 and 1968. Since 1972 the share has leveled off at 27 percent. The 26-percent annual growth rate of federally financed capital expenditures in the 1964-68 period and its subsequent 9-percent annual rate of decline from 1968 to 1972 has contributed to the large shifts in capital funding in the academic sector. In the 1973-74 period total and Federal support have remained essentially at the same level, although in constant dollars, declines of 8 percent and 7 percent, respectively, were recorded.

All areas of science except the life sciences shared in the sizable decline of capital expenditures during the 1968-74 period, with declines ranging from 1 percent per year in the interdisciplinary sciences to 17 percent per year in the physical and environmental sciences combined. Life sciences during the 1968-74 period continued to increase, but at only 1.5 percent annually. Life sciences amounted to $495 million, or 59 percent of the academic total in 1974, up from 42 percent in 1968. The physical and environmental sciences combined dropped from 27 percent of the 1968 total to 14 percent in 1974. Engineering dropped sharply from 14 percent of the 1970 total to 7 percent in 1973 before recovering to an 11-percent share in 1974.

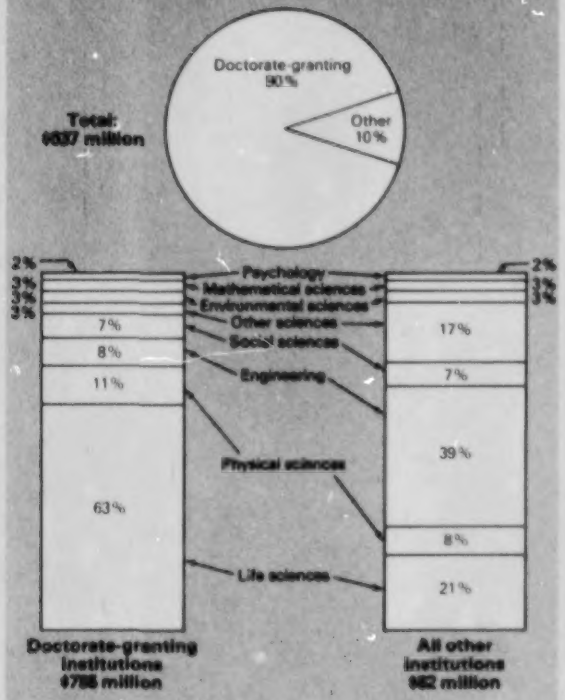
Capital expenditures for research, development, and instruction in the sciences and engineering, by area of science: selected years



SOURCE: National Science Foundation.

Since doctorate-granting institutions accounted for 90 percent of all capital expenditures in the academic sector in 1974, the distribution of funds by field and source was similar to the total. In contrast, nondoctorate-granting institutions allocated 39 percent of their capital expenditures for engineering and 21 percent in the life sciences. Nondoctorate capital expenditures also increased 10 percent from 1973 to 1974 compared with a 1-percent decline in doctorate funding. The Federal Government increased its share of capital funding in nondoctorate institutions from 17 percent in 1973 to 42 percent in 1974.

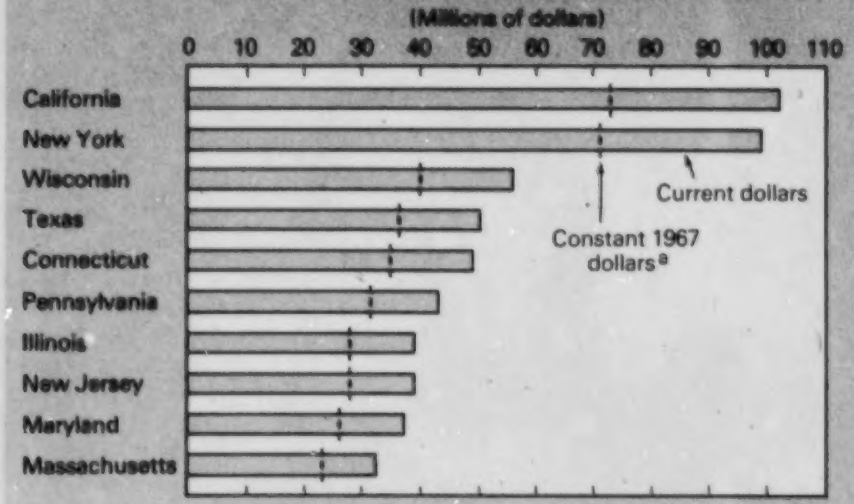
Capital expenditures for research, development, and instruction in the sciences and engineering, by type of institution and field of science: FY 1974



SOURCE: National Science Foundation.

The 10 leading States in terms of capital expenditures accounted for 65 percent of all such funding in 1974. Institutions in California increased their capital funding 42 percent in the 1973-74 period and moved ahead of New York as the leading State with $102 million. New York ranked second with $99 million in capital expenditures. Together, these two States accounted for one-fourth the academic sector's capital funding total. Connecticut and New Jersey moved into the top 10 in 1974 due to large capital outlays for medical facilities at the University of Connecticut and the College of Medicine and Dentistry of New Jersey.

Capital expenditures for research, development, and instruction in the sciences and engineering at universities and colleges in the 10 leading States: FY 1974



[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

Section 3. CURRENT DIRECT EXPENDITURES FOR INSTRUCTION AND DEPARTMENTAL RESEARCH IN GRADUATE-DEGREE-GRANTING INSTITUTIONS IN THE SCIENCES AND ENGINEERING

Institutions granting graduate degrees in the sciences and engineering allocated $3.9 billion of current funds to direct costs of instruction and departmental research expenditures in the sciences and engineering in 1974. This represents a 9-percent increase over the $3.6 billion expended by these institutions in 1973.

The life sciences accounted for the largest share (39 percent of the total) and the largest growth rate (13 percent between 1973 and 1974), of any area of science. The social sciences ranked second and accounted for a constant 21-percent share in the 1972-74 period. Engineering and the physical sciences each accounted for an 11-percent and a 10-percent share, respectively, down slightly from 1972.

The percent distribution of these funds between instruction and departmental research activities is at best a rough estimate because of the accounting and conceptual problems involved. In fact, many institutions did not attempt an estimate. In view of the resulting high imputation rates, these data must be used with caution. (See appendix A, p. 24).

It is worth noting, however, that the total and most individual areas of science show slight increases over the 3-year period 1972-74. If Federal R&D support continues to decrease, it is not illogical to expect at least a short-term continuation of very slight increases in departmental research funding in order that institutions can retain high-quality research staff (table 7).

Table 7. Current direct expenditures for instruction and departmental research in graduate-degree-granting institutions in the sciences and engineering: fiscal years 1972-74

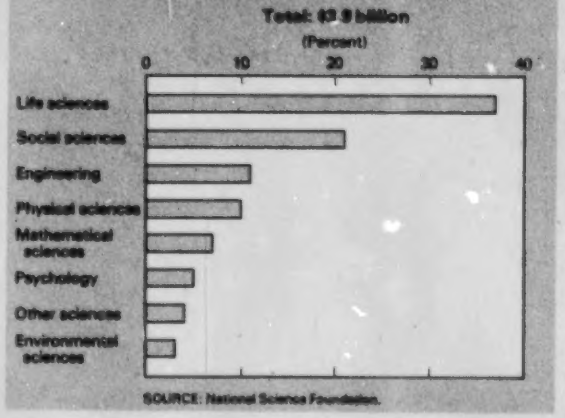
[Dollar in thousands]

Area of science	Total instruction and departmental research			Estimated departmental research as percent of total instruction and departmental research[1]		
	1972	1973	1974	1972	1973	1974
Total	$3,203,396	$3,563,595	$3,883,775	10.9	12.2	11.0
Engineering	372,596	390,407	413,851	8.7	11.0	10.3
Physical sciences	350,883	379,620	399,688	12.2	12.9	11.6
Environmental sciences	89,719	100,092	110,979	11.5	14.0	11.3
Mathematical sciences	233,778	254,602	267,365	8.7	11.1	10.6
Life sciences	1,159,196	1,346,141	1,521,819	12.4	13.9	11.9
Psychology	155,378	166,370	186,007	8.8	10.3	10.1
Social sciences	679,555	745,772	830,202	10.5	10.7	10.5
Other sciences	162,291	180,991	153,864	8.8	8.9	8.0

[1] Departmental research data are based on rough estimates provided by institutional respondents.

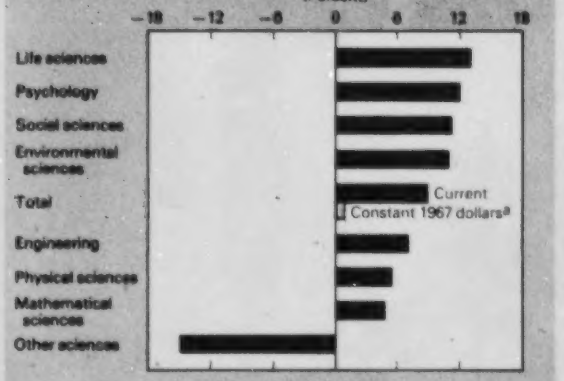
SOURCE: National Science Foundation

Current direct expenditures for instruction and departmental research at graduate-degree-granting institutions, by area of science: FY 1974



SOURCE: National Science Foundation.

Annual rates of change in current direct expenditures for instruction and departmental research in graduate-degree-granting institutions, by area of science: FY 1973-74



[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

Part II

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS ADMINISTERED BY UNIVERSITIES AND UNIVERSITY CONSORTIA

Overview

Federally Funded Research and Development Centers (FFRDC's) are R&D -performing organizations substantially financed by the Federal Government to meet either a particular R&D objective or to provide major facilities at universities for research. Federal agencies' funds accounted for 99.6 percent of R&D expenditures by FFRDC's in 1974. This section is devoted to summary data on FFRDC's administered by universities and university consortia and does not include data for universities and colleges shown in part I of this report.

Each FFRDC is a separate operational unit conducting R&D work upon direct request of, or under a broad charter from, the sponsoring Federal agency. Organizationally, the 22 centers are separate from the administering academic institution and are self-contained entities insofar as their R&D work is concerned.

Type of R&D Activity

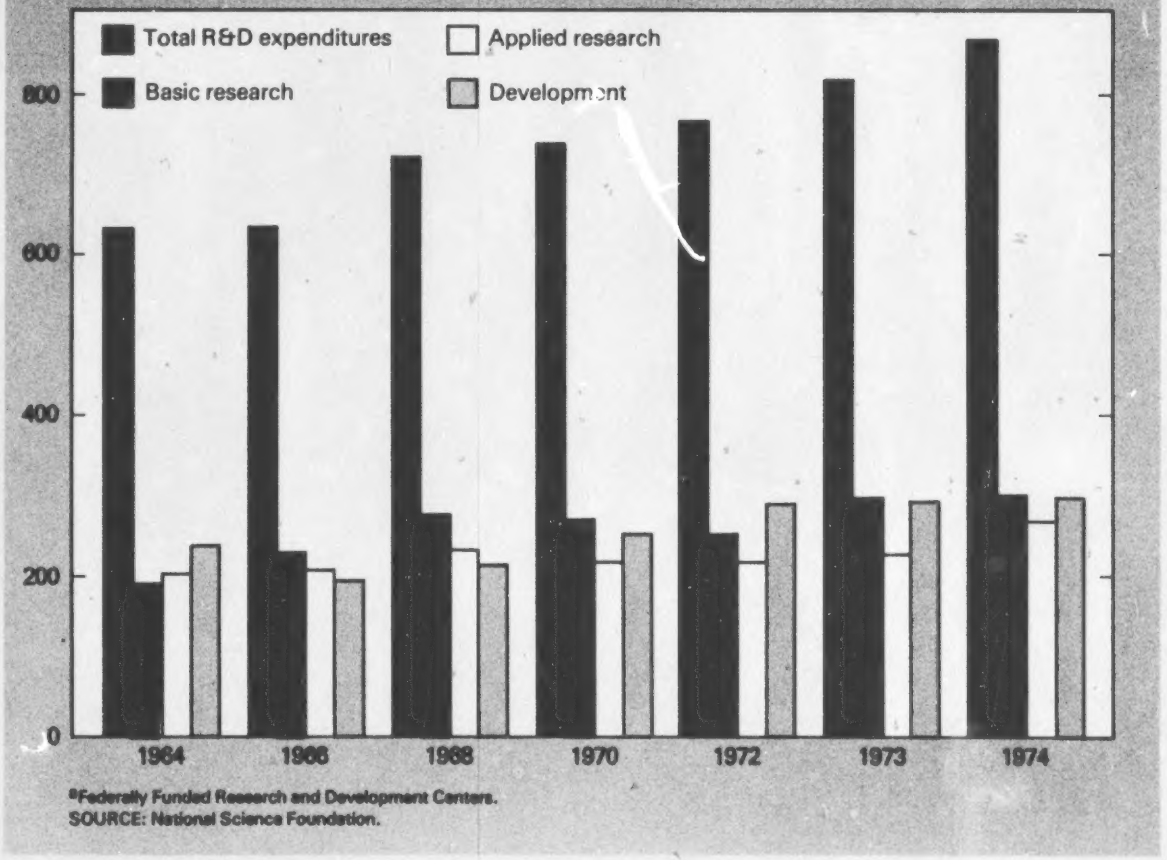
The 22 university-administered FFRDC's covered in this survey expended $865 million for research and development in 1974, an increase of 6 percent in current dollars from the $817 million spent by 23 FFRDC's in 1973.

R&D expenditures in this sector have increased at an average annual rate of 3 percent over the last decade. When converted to constant dollars, however, R&D expenditures have declined at an average annual rate of 1 percent during the same period.[6]

Basic research expenditures in 1974 increased for the second consecutive year to $300 million, although the growth rate in current dollars was modest compared to the 19-percent rate between 1972 and 1973. The Los Alamos Scientific Laboratory and Lawrence Livermore Laboratory accounted for most of the 1972-73 increase in basic research. Spending for basic research accounted for 35 percent of the total R&D effort in 1974, and continued to surpass outlays for development or applied research.

Expenditures for applied research increased 18 percent in 1974 to $267 million. However, applied research expenditures fluctuated considerably since 1964, with increases peaking at $231 million in 1968, a drop in 1970, followed by steady increases finally surpassing the 1968 level in 1974. In constant dollars, applied research expenditures in 1974 remained slightly above the 1970 level. Expenditures for development increased continuously since 1966, at an average rate of 5 percent per year, to a total of $298 million in 1974. In constant dollars, development increased at an average annual rate of 1 percent since 1966.

R&D expenditures in university-administered FFRDC's,[a] by character of work: FY 1964-74



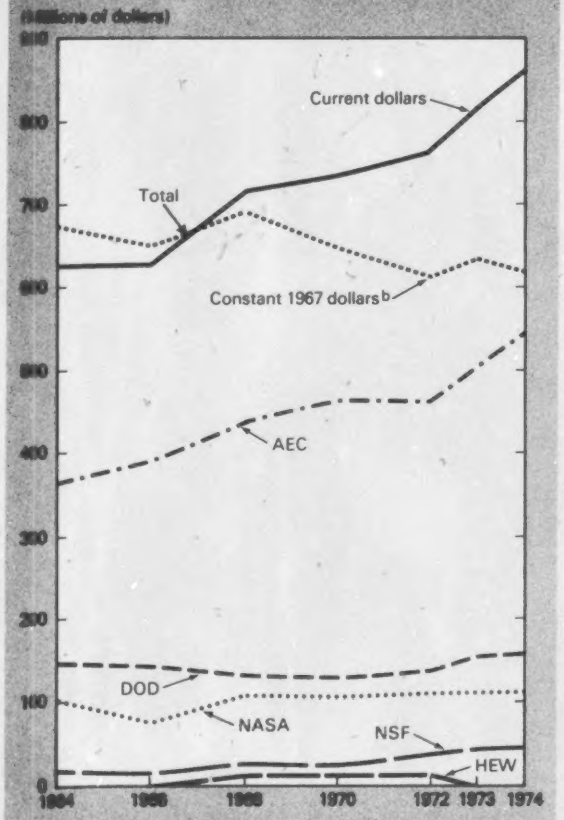
[a]Federally Funded Research and Development Centers.
SOURCE: National Science Foundation.

[6] The number of university-affiliated FFRDC's was reduced by one in 1974 when the Applied Physics Laboratory was organizationally assimilated by the University of Washington.

Agency Trends

During the past decade R&D expenditures at FFRDC's sponsored by the National Science Foundation (NSF) increased at an average annual growth rate of 10 percent, from $17 million in 1964 to $46 million in 1974. In 1974, the National Center for Atmospheric Research accounted for over one-half of NSF-sponsored research and development ($24 million).

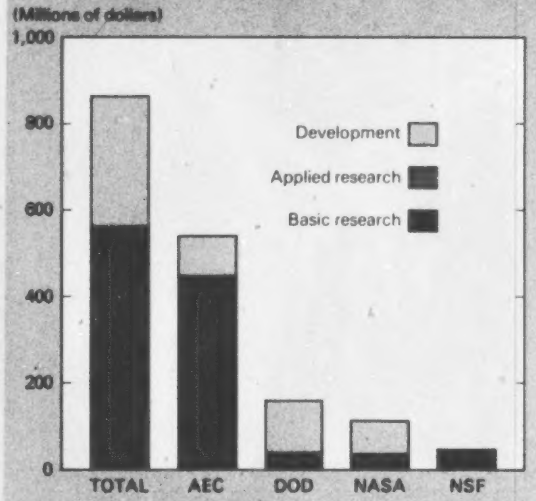
Current R&D expenditures in university-administered FFRDC's,[a] by sponsoring Federal agency: FY 1964-74



[a]Federally Funded Research and Development Centers.
[b]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

In the last 10 years, R&D performance at Atomic Energy Commission's (AEC) FFRDC's increased at an average annual rate of 3 percent, from $366 million in 1964 to $547 million in 1974. During this period both the Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) increased R&D outlays at their centers by $12 million to $159 million and $113 million, respectively. AEC-sponsored centers spent 43 percent of their 1974 outlays on basic research and 39 percent on applied research, with only 18 percent for development. This sharply contrasted with the portions of total R&D expenditures for development at DOD centers, 75 percent, and NASA centers, 70 percent. The five NSF-sponsored centers concentrated all of their outlays ($46 million) in basic research.

Distribution of current R&D expenditures in university-administered FFRDC's,[a] by character of work and sponsoring Federal agency: FY 1974

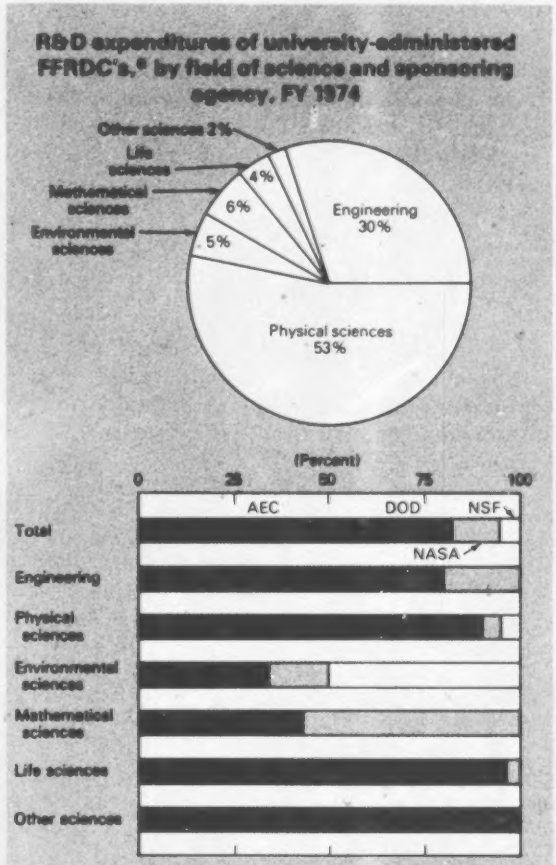


[a]Federally Funded Research and Development Centers.
SOURCE: National Science Foundation.

Field of Science

The physical sciences and engineering accounted for five-sixths of the total R&D efforts by university-administered FFRDC's in 1974, or 53 percent and 30 percent, respectively. Eighty-five percent of research and development in the physical sciences was sponsored by AEC. Lawrence Livermore Laboratory and Los Alamos Scientific Laboratory utilized one-half of AEC-sponsored funding in the physical sciences. Engineering R&D expenditures were heavily sponsored by DOD ($112 million) and AEC ($96 million).

R&D expenditures of university-administered FFRDC's,[a] by field of science and sponsoring agency, FY 1974



[a]Federally Funded Research and Development Centers.
SOURCE: National Science Foundation.

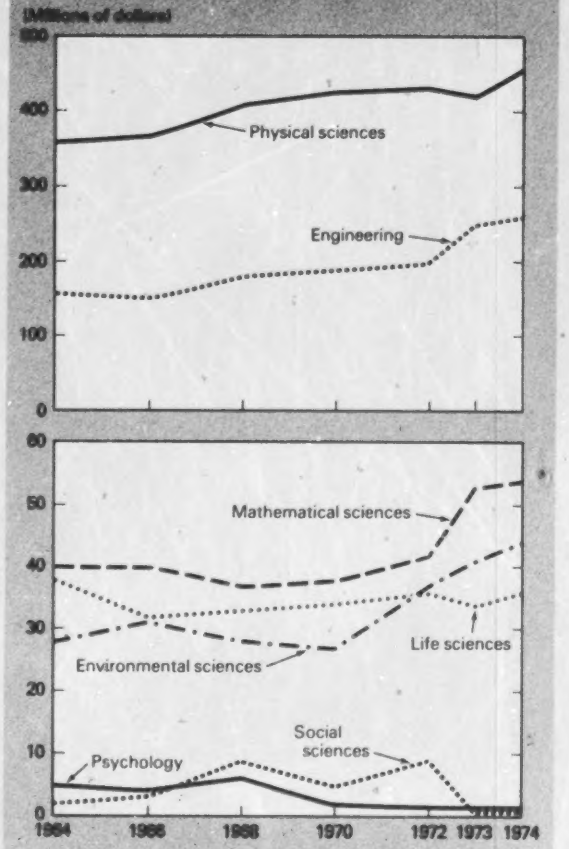
The National Center for Atmospheric Research accounted for nearly one-half ($21 million) of all funds spent by nine FFRDC's for environmental research. R&D expenditures by FFRDC's in the life sciences ($36 million) accounted for 4 percent of total R&D outlays. This contrasted sharply with the 54-percent life science share in universities and colleges.

Since 1964 R&D expenditures for engineering and environmental sciences at FFRDC's have shown the highest average growth of any field of science, each 5 percent per year. Engineering research and development has increased from $155 million in 1964 to $261 million in 1974. Research in energy, defense, and space projects accounted for the bulk of engineering outlays. For example, the Jet Propulsion Laboratory's (JPL) R&D work on the communication and orbitor portions of the Viking Project helped to boost JPL's engineering R&D outlays to $52 million.

Physical science expenditures increased 2 percent per year and the mathematical sciences showed R&D expenditure increases of 3 percent annually during the 1964-74 decade. R&D outlays in the social sciences decreased rapidly from 1972 ($9 million) to 1973 ($0.2 million), when the Office of Education (OE) began awarding, on a competitive basis, obligations that previously went to eight FFRDC's. These OE-sponsored centers had expended $10 million in 1972.

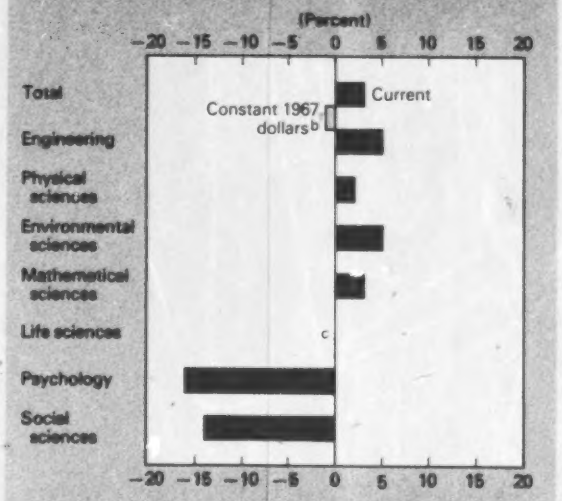
The largest FFRDC performer was the Lawrence Livermore Laboratory ($147 million). Nine-tenths of this center's research and development was in the physical sciences, with over one-half devoted to nuclear research. Some other areas of this center's physical science research include a laser fusion project, controlled thermonuclear research (using magnetic confinement), and applied technology for nuclear energy (i.e., coal gasification, oil shale, etc.).

Current R&D expenditures in university-administered FFRDC's,[a] by area of science: FY 1964-74



[a]Federally Funded Research and Development Centers.
SOURCE: National Science Foundation.

R&D expenditures in university-administered FFRDC's,[a] by field of science and average annual percent change: FY 1964-74



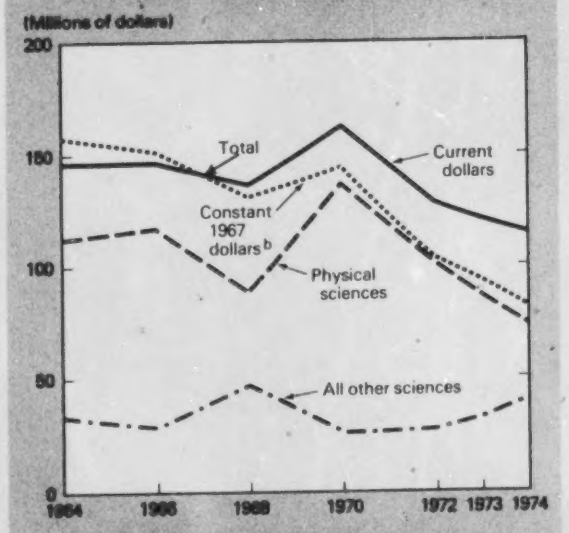
[a]Federally Funded Research and Development Centers.
[b]Based on GNP implicit price deflator.
[c]Less than 0.5 percent.
SOURCE: National Science Foundation.

Capital Expenditures for Facilities and Equipment

Capital spending for scientific and engineering facilities and equipment at university-administered FFRDC's totaled $115 million in 1974, a decline of $6 million from 1973. Capital expenditures have been declining since 1970, when they peaked at $163 million, a trend that is directly related to capital expenditures in the physical and environmental sciences.

The Fermi National Accelerator Laboratory reported the largest capital disbursements ($25 million) among FFRDC's in 1974. Most of this amount went for the fabrication and installation of major equipment items for future research projects.

Capital expenditures in university-administered FFRDC's,[a] by field of science: FY 1964-74



[a]Federally Funded Research and Development Centers.
[b]Based on GNP implicit price deflator.
SOURCE: National Science Foundation.

APPENDIXES

A. Technical Notes

B. Statistical Tables, Part I

C. Federally Funded Research and Development Centers and Summary Table, Part II

D. Reproduction of Covering Letter

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Note

The detailed statistical tables for this volume for parts I and II, appendixes B and C, have been published separately under one cover.

Included in this volume are appendix B summary tables 3, 7, 16, and 32 and appendix C summary table 1, as well as a complete listing of all the tables in appendixes B and C.

APPENDIX A

Technical Notes

Scope and Coverage

This report is based upon the National Science Foundation's "Survey of Scientific Activities of Institutions of Higher Education (Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering, FY 1974)."[1] In October 1974, a total of 603 universities and colleges received survey questionnaires. All doctorate- and master's-degree-granting institutions and all other academic institutions performing at least $50,000 in R&D expenditures received a survey package. In addition, 22 Federally Funded Research and Development Centers (FFRDC's) were surveyed. Data for these centers are provided in part II of this report.

Close contact was maintained with survey respondents to provide encouragement and assistance in providing timely data. As part of this liaison effort, telephone contacts were made in November 1974 and January 1975 to all nonrespondent universities. Prior to the summarizing of computer tabulations (April 30, 1975), 573 universities and colleges, or 95 percent of the survey universe, had responded with usable questionnaires. For the second successive year all of the top 100 largest R&D performers responded to the survey (table A-1).

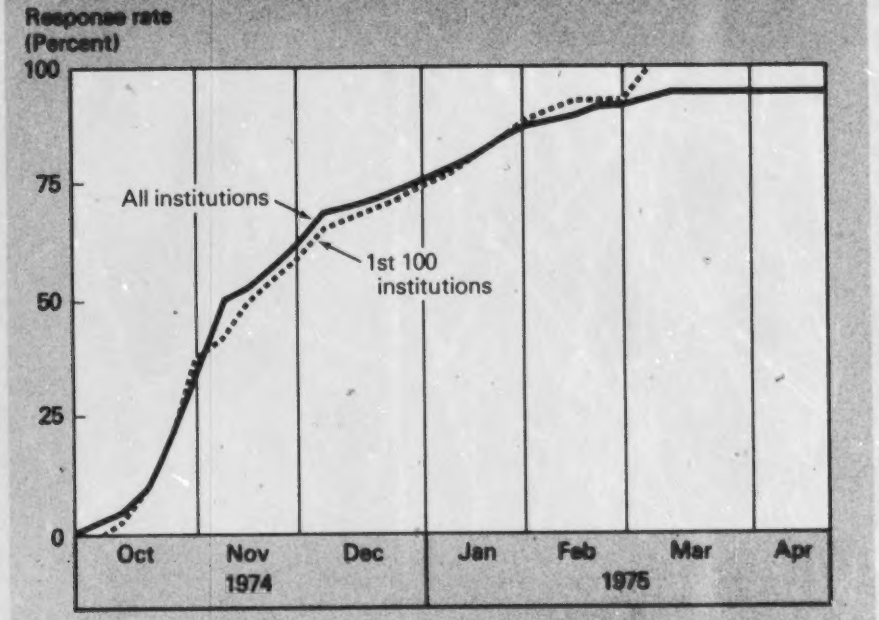
Over 5 months elapsed between the survey mailout and the receipt of usable questionnaires for the largest 100 R&D performers. The final 2 months of the collection period (March and April 1975) were spent in obtaining more detailed data from institutions that only partially completed the questionnaires. Many institutions were contacted so that major data fluctuations could be verified or corrected. In both instances survey questionnaire facsimiles identifying data errors or fluctuations from previous surveys were mailed to the respondent for corrective action or verification.

Table A-1. Number of institutions in the Survey of Scientific Activities at Universities and Colleges and the number that responded, by type of institution: fiscal year 1974

Type of institution	Number surveyed	Respondents	
		Number	Percent of total
Total	603	573	95.0
Doctorate	282	271	96.1
Master's	172	157	91.3
Bachelor's and no science degree	149	145	97.3

SOURCE: National Science Foundation

Response rate of institutions included in the *Survey of Scientific Activities of Institutions of Higher Education:* FY 1974



SOURCE: National Science Foundation.

[1] Data obtained in earlier surveys in the series have been published by the National Science Foundation in *Scientific Activities at Universities and Colleges, 1964* (NSF 68-22), 1968; *Resources for Scientific Activities at Universities and Colleges, 1969* (NSF 70-16), 1970; *Resources for Scientific Activities at Universities and Colleges, 1971* (NSF 72-315), and *Expenditures for Scientific Activities at Universities and Colleges, Fiscal Year 1973* (NSF 75-316), 1975 (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office). No separate reports were issued for the 1966 and 1972 surveys; however, results of these surveys are included in this report. Data collected in the three surveys conducted prior to the inception of the present series have been published in the National Science Foundation's *Scientific Research and Development in Colleges and Universities - Expenditures and Manpower 1953-54, 1958; Scientific Research and Development in Colleges and Universities - Expenditures and Manpower, 1958, 1963;* and, *Scientists and Engineers in Colleges and Universities, 1961, 1965* (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office).

TABLE A-2.

CURRENT R&D EXPENDITURES ESTIMATED FOR NONRESPONDENT UNIVERSITIES AND COLLEGES BY TYPE OF INSTITUTION: FISCAL YEAR 1974 [a]

(DOLLARS IN THOUSANDS)

SOURCE, CHARACTER, AND FIELD	TOTAL		INSTITUTIONS GRANTING DEGREES IN SCIENCE & ENGINEERING						NO SCIENCE DEGREE	
			DOCTORATE		MASTER'S		BACHELOR'S			
	AMOUNT	PERCENT OF TOTAL	AMOUNT	PERCENT OF TOTAL	AMOUNT	PERCENT OF TOTAL	AMOUNT	PERCENT OF TOTAL	AMOUNT	PERCENT OF TOTAL
TOTAL	$27,814	0.9	$21,913	0.7	$3,649	6.5	$2,252	11.4	$ 0	0.0
SOURCE OF FUNDS:										
FEDERAL GOVERNMENT	23,204	1.1	16,692	.8	4,432	14.2	2,080	14.0	0	.0
STATE GOVERNMENT	2,376	.8	1,568	.5	738	5.6	70	9.0	0	.0
LOCAL GOVERNMENT	192	1.4	107	.8	65	12.1	14	7.0	6	10.5
FOUNDATIONS & VOLUNTARY HEALTH AGENCIES	12,513	8.8	12,069	8.7	334	11.7	110	9.7	0	.0
INDUSTRY	2,951	3.1	2,742	2.9	115	6.6	94	21.6	0	.0
INSTITUTIONS' OWN FUNDS	6,158	1.8	5,372	1.6	434	9.1	282	13.4	70	22.9
OTHER SOURCES	415	.5	248	.3	127	8.2	40	15.9	0	.0
CHARACTER OF WORK:										
BASIC RESEARCH	256,697	11.9	250,977	11.9	4,359	14.8	1,361	13.2	0	.0
APPLIED RESEARCH	133,629	18.0	130,253	18.3	2,217	10.7	1,112	15.6	47	20.6
DEVELOPMENT	21,305	16.9	19,849	17.0	838	14.8	303	13.0	315	22.1
FIELD OF SCIENCE:										
ENGINEERING (TOTAL)	6,919	2.0	6,474	1.9	261	11.1	184	16.0	0	.0
PHYSICAL SCIENCES (TOTAL)	5,485	1.6	3,637	1.1	1,330	17.7	476	10.3	42	43.8
ASTRONOMY	198	.8	138	.6	42	53.2	18	13.1	0	.0
CHEMISTRY	3,813	3.2	2,994	2.7	383	13.7	336	17.3	0	.0
PHYSICS	5,570	3.2	4,687	2.8	540	25.5	301	14.6	42	43.8
OTHER PHYSICAL SCIENCES, NEC	429	1.8	89	.4	267	15.2	73	14.8	0	.0
ENVIRONMENTAL SCIENCES (TOTAL)	4,207	1.8	3,637	1.6	346	6.9	224	18.7	0	.0
MATHEMATICAL SCIENCES (TOTAL)	1,630	2.1	1,342	1.8	115	11.8	121	12.3	52	42.6
MATHEMATICS (EXCLUDING COMPUTER SCIENCES)	1,285	3.4	1,004	2.7	170	28.0	59	14.5	52	42.6
COMPUTER SCIENCES	1,308	3.3	1,120	2.9	126	34.0	62	10.7	0	.0
LIFE SCIENCES (TOTAL)	33,862	2.1	30,058	1.9	2,501	12.5	1,195	20.3	108	84.4
AGRICULTURAL SCIENCES	4,047	1.3	3,535	1.1	357	3.4	155	17.1	0	.0
BIOLOGICAL SCIENCES	14,614	2.8	12,861	2.5	1,017	15.0	696	20.4	40	44.0
CLINICAL MEDICAL	15,488	2.2	14,255	2.0	830	61.2	403	46.9	0	.0
OTHER LIFE SCIENCES, NEC	2,287	4.0	1,679	3.0	416	30.4	175	24.2	17	45.9
PSYCHOLOGY (TOTAL)	1,397	1.9	730	1.0	375	18.5	292	12.3	0	.0
SOCIAL SCIENCES (TOTAL)	6,260	2.6	4,531	2.0	1,303	8.4	426	14.7	0	.0
ECONOMICS	2,311	4.7	2,053	4.3	194	16.0	64	15.4	0	.0
POLITICAL SCIENCE	504	1.9	363	1.4	120	22.9	21	11.1	0	.0
SOCIOLOGY	1,861	2.9	1,261	2.2	406	6.0	194	14.6	0	.0
OTHER SOCIAL SCIENCES, NEC	2,662	2.6	1,852	1.9	663	9.4	147	15.2	0	.0
OTHER SCIENCES, NEC (TOTAL)	2,249	2.6	1,816	2.2	219	8.9	152	23.4	62	27.6

[a] The imputed dollar volume of separately budgeted R&D expenditures of nonrespondent institutions amounted to $28 million, or .9 percent of the $3 billion universe total for all universities and colleges, both respondents and nonrespondents. SOURCE: NATIONAL SCIENCE FOUNDATION

Methods of Estimating for Nonresponse

Thirty institutions failed to supply usable data for this report and, in order to estimate data for these institutions, an imputation program was used to provide nonrespondent estimates. The imputation program used summary data, detailed by respondent characteristic (level of degree granted and type of control) to determine computed inflation factors. These factors were applied in conjunction with previous years' response records to create nonrespondent estimates.[2] R&D estimates (shown in table A-2) for nonrespondents totalled $28 million, or 0.9 percent of the $3 billion universe total. Only 11 doctorate-, 15 master's-, and 4 bachelor's-degree-granting institutions failed to respond to the survey.

[2] Estimates for nonrespondents for instruction and departmental research (shown in table A-3) were also imputed using the same methodology.

Table A-3. Estimated amounts for current direct expenditures for instruction and departmental research in graduate-degree-granting institutions in the sciences and engineering: fiscal year 1974

[Thousands of dollars]

Field of science	Instruction and departmental research		Departmental research	
	Estimated amount	Percent	Estimated amount	Percent
Total	$275,010	7.1	$165,768	38.6
Engineering	27,639	6.7	14,870	35.1
Physical sciences	31,882	8.0	15,322	33.0
Environmental sciences	9,509	8.6	3,890	31.0
Mathematical sciences	25,598	9.6	9,771	34.5
Life sciences	103,933	6.8	55,369	30.6
Psychology	17,256	9.3	5,488	29.1
Social sciences	65,448	7.9	30,071	34.4
Other sciences, n.e.c.	9,374	6.1	4,873	39.4

SOURCE: National Science Foundation

Development Expenditures

Development expenditures, which accounted for only 4 percent of total R&D expenditures in each of the years 1964-74, were first collected by field of science in 1973. Estimates for prior years were developed by NSF by: (a) contracting major universities with large development expenditures to ascertain how these were distributed by field of science, and (b) utilizing field of science growth patterns in these institutions to prorate development expenditures in earlier years. The exclusion from the report of the Draper Laboratory caused a decline in development expenditures in 1974.

Limitations

The statistics presented in this report are subject to response and concept errors caused by several factors: Differences between university concepts and survey definitions of R&D activities, and by variations in university accounting procedures. Consequently, the difficulty of defining R&D expenditures in the sciences and engineering adversely affects the accuracy of the data provided by respondents. As the survey series closes its seventh cycle, however, the magnitude of the error attributable to the inadequacy of institutional recordkeeping procedures is constantly decreasing, as more institutions, especially the larger ones, refine their procedures to yield the information requested. Since the large universities account for the vast majority of R&D activities in the sciences and engineering, the quality of their statistical reports has significant impact on the overall reliability of the survey data.

Efforts to Improve Data Quality

Since analysis of reporting error is essential in determining how the quality of individual institution responses can be improved, the National Science Foundation has conducted reliability and validity studies over the last several years. The first study was conducted by Dr. Robert Wright of the State University of New York at Albany who visited over 50 institutions in 1972-73, and his findings were published in a two-volume study, *Evaluation of the Survey of Scientific Activities of Institutions of Higher Education*.[3] In 1974, William Morsch of Columbia Research Associates conducted a pilot Post-Enumeration Test of the 1973 report of 9 institutions and his findings, although not published are available on request to NSF.[4]

[3] Data obtained from this study have been published by NSF in *Evaluation of the Survey of Scientific Activities of Institutions of Higher Education*, prepared by Robert R. Wright, 1973.

[4] William Morsch, *Pilot Post-Enumeration Survey*, unpublished report, Columbia Research Associates, 1973.

In May 1975, the National Center for Higher Education Management Systems (NCHEMS), under a grant from the Division of Science Resources Studies, conducted a systematic analysis of the NSF expenditure and manpower surveys with the objective of ensuring that the data categories, definitions, and instructions are consistent with those in common usage in institutions and with those used in other national data collection efforts. Subsequently, as a result of the NCHEMS findings, NSF drafted revisions of the survey instruments and sponsored a national conference on the NSF University Science Statistics Program in May 1975. The conference brought together NSF survey-data users and university-and-college respondents, and the objectives of the conference were to:

1. Identify and discuss specific problems associated with survey instruments and solicit from conference participants suggestions as to how these problems might be solved.
2. Describe the significant issues now being faced by NSF and initiate discussions concerning ways of acquiring limited amounts of information needed to address these issues.
3. Continue the dialogue between NSF and a group of key data providers concerning the collection of data by the Foundation and the uses to which these data are put.

Many recommendations were made at the conference, and the participants made helpful suggestions about improving the survey instruments and ways to maintain a continuing dialogue between NSF and survey respondents. The revised survey instruments are presently being reviewed by institutional respondents prior to implementation by NSF.

Among the specific items discussed at the conference by institutional representatives were areas of difficulty in responding to the survey, including ambiguity in the taxonomy of the questionnaire. As a result of the discussion, the conferees called for more precise instructions for the exclusion of training grants, subcontracts, and other expenditures not specifically research and development in nature. The conference participants also suggested that R&D expenditures for all academic disciplines be collected as well as for science and engineering disciplines, in order to place R&D activities in proper perspective to the overall functions of the institutions.

The conferees, in addressing a National Science Board request for basic research by field of science data, agreed that such information could best be provided by department chairpersons, and NSF agreed to develop a departmental worksheet to assist respondents in gathering this information. It was the consensus of the conference participants that departmental chairpersons could best respond to data requests for departmental research outlays. Accordingly, a departmental data sheet and the fiscal year 1975 questionnaire included an item designed to collect basic research on an optional basis.

APPENDIX B

A Listing of Statistical Tables

Part I
Universities and Colleges

(Only summary tables 3, 7, 16, and 32 appear in this volume)

Reproduction of Survey Form

(including aggregate data)

CURRENT SEPARATELY BUDGETED R&D EXPENDITURES

B-1. By year and source of funds, FY 1953-73
B-2. By year and character of work, FY 1953-73

CURRENT SEPARATELY BUDGETED R&D EXPENDITURES BY SOURCE OF FUNDS, CHARACTER OF WORK, AND FIELD OF SCIENCE

B-3. Summary for selected years, FY 1964-73
B-4. Summary for all doctorate-granting institutions, selected years, FY 1964-74
B-5. Summary for all doctorate, master's, bachelor's, and no science degree-granting institutions, FY 1973
B-6. Summary for all Federal, State, local, and private institutions, FY 1973

FEDERALLY FINANCED CURRENT R&D EXPENDITURES BY CHARACTER OF WORK AND FIELD OF SCIENCE

B-7. Summary for selected years, FY 1964-73
B-8. Summary for all doctorate, master's, bachelor's, and no science degree-granting institutions, FY 1973
B-9. Summary for all Federal, State, local, and private institutions, FY 1973

GEOGRAPHIC DISTRIBUTION OF SEPARATELY BUDGETED CURRENT R&D EXPENDITURES

B-10. Total R&D expenditures for selected years, FY 1964-73
B-11. By character of work, total and federally financed, FY 1973
B-12. Federally financed for selected years, FY 1964-73
B-13. By source of funds for all institutions, FY 1973
B-14. By source of funds in public institutions, FY 1973
B-15. By source of funds in private institutions, FY 1973
B-16. By field of science for all institutions, FY 1973
B-17. By field of science in public institutions, FY 1973
B-18. By field of science in private institutions, FY 1973

PERCENT DISTRIBUTION OF R&D EXPENDITURES GROUPED BY UNIVERSITIES AND COLLEGES WITH LARGEST R&D PROGRAMS

B-19. By source of funds, FY 1973
B-20. By field of science, FY 1973

SEPARATELY BUDGETED CURRENT R&D EXPENDITURES IN DESCENDING ORDER OF AMOUNTS, BY INSTITUTION

B-12. Source of funds for 400 largest R&D performers, FY 1973
B-22. Source of funds for 150 largest public universities, FY 1973
B-23. Source of funds for 100 largest private universities, FY 1973
B-24. Broad field of science for 200 largest R&D performers, FY 1973
B-25. Broad field of science for 100 largest public universities, FY 1973
B-26. Broad field of science for 100 largest private universities, FY 1973
B-27. Federally financed broad fields of science for 150 largest R&D performers, FY 1973
B-28. Federally financed broad fields of science for 100 largest public universities, FY 1973
B-29. Federally financed broad fields of science for 100 largest private universities, FY 1973
B-30. Total and federally financed life sciences for the 100 largest performers in the life sciences, FY 1973
B-31. Detailed physical and mathematical sciences for 100 largest performers in the physical sciences, FY 1973
B-32. Detailed federally financed physical and mathematical sciences for the 100 largest performers in the physical sciences, FY 1973
B-33. Total and federally financed social sciences for the 100 largest performers in the social sciences, FY 1973

CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT AND INSTRUCTION

B-34. Total and federally financed by field of science for selected years, FY 1964-73
B-35. Total and federally financed by field of science for doctorate, master's, bachelor's, and no science degree-granting institutions, FY 1973
B-36. Total and federally financed by field of science for Federal, State, local, and private institutions, FY 1973
B-37. Geographic distribution of total capital expenditures, by field of science, FY 1973
B-38. Geographic distribution of federally financed expenditures, by field of science, FY 1973
B-39. Total capital expenditures in descending order of amounts for the 150 largest institutions, FY 1973
B-40. Federally financed expenditures in descending order of amounts for the 150 largest institutions, FY 1973

TABLE B-3. CURRENT R&D EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY SOURCE OF FUNDS, CHARACTER OF WORK, AND FIELD OF SCIENCE, FOR SELECTED YEARS: FISCAL YEARS 1964-74

(DOLLARS IN THOUSANDS)

SOURCE, CHARACTER, AND FIELD	1964	1966	1968	1970	1972	1973	1974
TOTAL CURRENT R & D EXPENDITURES	$1,275,436	$1,714,684	$2,148,708	$2,334,859	$2,676,511	$2,936,707	$3,017,391[a]
SOURCE OF FUNDS:							
FEDERAL GOVERNMENT	917,322	1,261,034	1,572,064	1,647,500	1,838,933	2,041,495	2,033,475[a]
STATE GOVERNMENT	122,496	144,258	161,808	206,907	255,832	280,653	315,329
LOCAL GOVERNMENT	9,964	11,718	10,387	11,870	12,873	14,510	14,042
FOUNDATIONS & VOLUNTARY HEALTH AGENCIES	61,411	76,511	95,264	110,391	128,213	131,222	142,648
INDUSTRY	40,363	42,242	55,253	60,538	75,447	85,811	96,033
INSTITUTIONS' OWN FUNDS	102,581	147,286	217,810	243,051	306,858	314,332	339,903
OTHER SOURCES	21,299	31,635	36,122	54,602	58,355	68,684	75,961
CHARACTER OF WORK:							
BASIC RESEARCH	1,002,980	1,303,114	1,649,616	1,795,864	2,020,541	2,053,022	2,149,513
APPLIED RESEARCH	231,852	328,276	403,643	426,714	546,233	716,197	741,470
DEVELOPMENT	40,604	83,294	95,449	112,281	109,737	167,488	126,408
FIELD OF SCIENCE:							
ENGINEERING (TOTAL)	161,572	259,176	309,137	318,836	347,341	383,013	346,292
PHYSICAL SCIENCES (TOTAL)	216,989	286,707	319,739	307,310	329,900	333,838	339,435
ASTRONOMY	15,571	22,676	24,103	18,597	21,974	24,089	24,840
CHEMISTRY	70,022	87,955	104,695	102,002	110,015	114,293	117,479
PHYSICS	119,578	159,135	172,660	161,921	161,853	171,052	173,232
OTHER PHYSICAL SCIENCES, NEC	11,818	16,941	18,281	24,790	36,058	24,404	23,884
ENVIRONMENTAL SCIENCES (TOTAL)	54,814	68,019	120,463	125,315	192,331	207,638	231,138
MATHEMATICAL SCIENCES (TOTAL)	32,666	42,489	57,621	72,413	70,536	74,354	77,026
MATHEMATICS (EXCLUDING COMPUTER SCIENCES)	NA	NA	NA	NA	NA	36,433	37,822
COMPUTER SCIENCES	NA	NA	NA	NA	NA	37,921	39,204
LIFE SCIENCES (TOTAL)	681,594	872,336	1,037,031	1,194,249	1,352,601	1,526,245	1,616,337
AGRICULTURAL SCIENCES	(b)	(b)	(b)	(b)	231,057[c]	271,593[c]	323,364
BIOLOGICAL SCIENCES	315,471	422,483	490,607	547,193	451,239	547,145	525,877
CLINICAL MEDICAL	320,086	389,618	477,346	549,121	604,987	646,969	709,395
OTHER LIFE SCIENCES, NEC	46,037	60,235	69,078	97,935	65,318	60,538	57,701
PSYCHOLOGY (TOTAL)	31,904	40,143	59,286	59,250	70,400	74,137	75,415
SOCIAL SCIENCES (TOTAL)	81,539	109,279	167,986	168,669	206,344	231,181	245,317
ECONOMICS	24,068	31,695	35,017	38,616	46,586	47,037	49,303
POLITICAL SCIENCE	6,876	8,979	20,742	19,273	21,771	25,525	26,970
SOCIOLOGY	14,664	20,000	38,587	44,383	59,475	61,652	64,878
OTHER SOCIAL SCIENCES, NEC	35,931	48,605	73,640	66,397	78,512	96,967	104,166
OTHER SCIENCES, NEC (TOTAL)	14,358	36,535	77,445	88,817	107,058	106,301	86,431

a/ Excludes Draper Laboratory with $55 million in R&D expenditures. This institution is classified as part of the independent nonprofit sector in 1974.

b/ Not separately available, included in Biological sciences.

c/ Estimated, based on data collected in 1974.

NOTE: NA - not available

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-7. FEDERALLY FINANCED CURRENT R&D EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY CHARACTER OF WORK, FIELD OF SCIENCE, FOR SELECTED YEARS: FISCAL YEARS 1964-74

(DOLLARS IN THOUSANDS)

CHARACTER AND FIELD	1964	1966	1968	1970	1972	1973	1974
TOTAL	$917,322	$1,261,034	$1,572,064	$1,647,500	$1,838,933	$2,041,495	$2,033,475[a]
CHARACTER OF WORK:							
BASIC RESEARCH	766,225	1,008,805	1,250,782	1,296,120	1,419,428	1,458,592	1,522,793[a]
APPLIED RESEARCH	128,405	193,515	253,577	267,651	339,387	462,919	439,434
DEVELOPMENT	22,692	58,714	67,705	83,729	80,118	119,984	71,248
FIELD OF SCIENCE:							
ENGINEERING(TOTAL)	126,962	209,248	246,191	245,888	259,058	287,331	239,551
PHYSICAL SCIENCES(TOTAL)	187,457	247,603	273,048	257,822	267,392	272,951	271,449
ASTRONOMY	13,651	20,123	21,079	15,516	16,854	17,673	17,385
CHEMISTRY	55,410	68,955	82,668	78,942	84,582	87,023	88,414
PHYSICS	109,938	146,058	156,241	144,306	139,629	148,654	148,187
OTHER PHYSICAL SCIENCES,NEC	8,458	12,467	13,060	19,058	26,327	19,601	17,463
ENVIRONMENTAL SCIENCES(TOTAL)	44,891	54,325	88,691	88,127	142,110	156,374	166,088
MATHEMATICAL SCIENCES(TOTAL)	28,128	34,394	45,610	54,338	53,207	55,555	57,754
MATHEMATICS (EXCLUDING COMPUTER SCIENCES)	NA	NA	NA	NA	NA	28,574	29,309
COMPUTER SCIENCES	NA	NA	NA	NA	NA	26,981	28,445
LIFE SCIENCES(TOTAL)	455,014	595,301	725,017	814,417	884,212	1,015,230	1,053,039
AGRICULTURAL SCIENCES	(b)	(b)	(b)	(b)	80,228[c]	95,570[c]	99,832
BIOLOGICAL SCIENCES	176,933	252,371	306,471	334,851	319,625	396,424	370,781
CLINICAL MEDICAL	256,874	312,801	381,936	431,656	448,805	486,522	540,111
OTHER LIFE SCIENCES,NEC	21,207	30,129	36,610	47,910	35,554	36,714	42,255
PSYCHOLOGY(TOTAL)	27,572	34,393	48,547	47,263	54,865	58,696	58,552
SOCIAL SCIENCES(TOTAL)	42,147	61,914	100,846	94,655	113,935	132,844	135,923
ECONOMICS	10,565	15,520	17,537	17,688	20,940	22,807	22,413
POLITICAL SCIENCE	3,127	4,593	10,444	7,920	8,592	10,365	11,345
SOCIOLOGY	8,739	12,837	26,095	26,220	35,694	40,955	41,252
OTHER SOCIAL SCIENCES,NEC	19,716	28,964	46,770	42,827	48,709	58,717	60,913
OTHER SCIENCES, NEC (TOTAL)	5,151	23,856	44,114	44,990	64,154	62,514	51,119

a/ Excludes Draper Laboratory with $55 million in R&D expenditures. This institution is classified as part of the independent nonprofit sector in 1974.

b/ Not separately available, included in biological sciences.

c/ Estimated, based on data collected in 1974.

NOTE: NA - not separately available

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-16. TOTAL AND FEDERALLY FINANCED EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY INSTITUTION: FISCAL YEARS 1972-74

(DOLLARS IN THOUSANDS)

INSTITUTIONS RANKED BY TOTAL R&D EXPENDITURES (1974)	TOTAL R&D EXPENDITURES 1974	1973	1972	FEDERALLY FINANCED R&D EXPENDITURES 1974	1973	1972
UNITED STATES TOTAL	$3,017,391	$2,936,707	$2,676,511	$2,033,475	$2,041,495	$1,838,933
1 UNIV OF WISCONSIN-MADISON	86,088	84,201	71,673	47,339	45,783	37,780
2 MASS INST OF TECHNOLOGY	76,993 a/	125,413	116,306	62,455 a/	112,652	104,440
3 U OF CAL SAN DIEGO	67,209	66,789	57,307	60,904	60,945	52,295
4 UNIVERSITY OF MICHIGAN	62,880	69,229	67,677	39,867	45,021	45,427
5 UNIVERSITY OF MINNESOTA	60,404	53,447	48,388	35,237	30,800	27,872
6 U OF CAL BERKELEY	58,294	56,692	45,885	43,123	42,716	34,995
7 HARVARD UNIVERSITY	58,207	58,480	63,647	47,293	47,765	43,144
8 UNIVERSITY OF WASHINGTON	56,688	53,424	45,091	49,103	47,305	39,375
9 CORNELL UNIVERSITY	56,542	57,453	50,754	33,269	32,273	30,300
10 COLUMBIA UNIV MAIN DIV	56,465	57,376	51,773	45,210	46,362	39,975
TOTAL 1ST 10 INSTS.	639,770	682,504	618,501	463,800	511,622	455,603
11 STANFORD UNIVERSITY	53,950	53,984	51,949	50,262	50,751	47,118
12 UNIVERSITY OF CHICAGO	52,581	52,181	45,292	39,126	38,400	34,091
13 JOHNS HOPKINS UNIVERSITY	50,924	42,268	38,008	41,764	35,416	29,870
14 U OF CAL LOS ANGELES	50,016	52,291	44,976	41,367	44,011	38,067
15 UNIV ILLINOIS URBANA	48,652	41,810	36,915	32,454	32,037	24,133
16 UNIV OF PENNSYLVANIA	46,421	40,594	38,682	38,232	31,388	29,555
17 UNIVERSITY OF ROCHESTER	38,850	38,497	31,008	28,559	30,135	26,434
18 TEXAS A & M UNIVERSITY	37,209	33,618	30,950	15,180	15,021	12,428
19 YALE UNIVERSITY	36,576	34,200	35,420	31,480	29,697	28,810
20 UNIV OF TEXAS AT AUSTIN	36,066	31,386	30,896	20,266	17,391	21,685
TOTAL 1ST 20 INSTS.	1,091,015	1,103,333	1,002,597	802,494	835,869	747,794
21 U OF CAL DAVIS	35,214	33,247	26,338	18,297	17,712	14,336
22 NEW YORK UNIVERSITY	34,333	37,219	36,766	25,994	27,081	27,322
23 U OF CAL SAN FRANCISCO	33,922	29,109	23,383	28,118	24,042	19,227
24 OHIO STATE UNIVERSITY	33,590	30,776	28,195	19,043	19,693	17,839
25 MICHIGAN STATE UNIVERSITY	32,483	32,534	21,237	21,253	20,554	16,992
26 PENNSYLVANIA STATE UNIV	32,078	30,280E	28,273	18,174	17,201E	15,859
27 UNIVERSITY OF COLORADO	31,273	34,365	31,435	23,761	26,774	26,003
28 UNIVERSITY OF GEORGIA	30,594	26,310	26,456	7,547	8,353	8,194
29 UNIVERSITY OF FLORIDA	30,453	27,254	25,356	10,118	10,699	9,142
30 PURDUE UNIV ALL CAMPUSES	30,307	27,315	26,118	17,830	16,692	14,875
TOTAL 1ST 30 INSTS.	1,415,462	1,411,750	1,276,154	992,629	1,024,670	917,583
31 UNIVERSITY OF ARIZONA	28,103	27,754	21,946	14,558	14,409	10,692
32 UNIVERSITY OF MIAMI	27,491	26,769	24,050	18,753	18,237	16,162
33 RUTGERS THE STATE UNIV	26,613	21,939	21,768	9,683	10,208	9,625
34 WASHINGTON UNIV ST LOUIS	25,923	25,286	21,568	23,497	22,666	18,793
35 UNIVERSITY OF UTAH	25,450	23,469	20,309	18,976	18,460	15,989
36	25,380	24,644	17,138C	22,412	19,930	14,318
37	24,722	24,103	17,204C	10,091	9,379	8,284
38 UNIV OF STHRN CALIFORNIA	24,624	25,155	18,482	20,916	21,855	16,183
39 YESHIVA UNIVERSITY	24,595	24,918	26,600E	20,906	21,571	19,650E
40 N C STATE UNIV AT RALEIGH	23,879	24,856	18,998	9,016	11,326	7,773
TOTAL 1ST 40 INSTS.	1,672,242	1,660,651	1,484,217	1,161,437	1,192,711	1,055,052
41 UNIV OF MISSOURI COLUMBIA	23,205	22,495	33,517	8,524	7,803	14,675
42 OREGON STATE UNIVERSITY	21,833	20,241	18,864	12,559	11,680	10,947
43 DUKE UNIVERSITY	21,208	22,261	21,201	17,621	19,296	19,535
44 UNIVERSITY OF HAWAII	21,143	24,846	23,520E	14,065	15,382	13,725E
45 COLORADO STATE UNIVERSITY	21,096	20,451	20,009	15,623	15,415	15,284
46 CALIFORNIA INST OF TECH	19,960	18,653	18,275	17,751	16,603	16,478
47 UNIVERSITY OF ALASKA	19,111	16,560	15,524	10,716	11,822	11,204
48 PRINCETON UNIVERSITY	18,945	18,696	17,211	13,413	13,742	12,743
49 UNIVERSITY OF KANSAS	18,895	17,925	15,765	14,535	14,141	11,391
50 UNIV OF MD COLLEGE PARK	18,619	20,365	18,124	11,396	12,635	11,315
TOTAL 1ST 50 INSTS.	1,876,257	1,863,144	1,696,227	1,297,642	1,331,230	1,192,349

SEE FOOTNOTE AT END OF TABLE.

TABLE B-16. CONTINUED

TOTAL AND FEDERALLY FINANCED EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY INSTITUTION: FISCAL YEARS 1972-74

(DOLLARS IN THOUSANDS)

INSTITUTIONS RANKED BY TOTAL R&D EXPENDITURES (1974)	TOTAL R&D EXPENDITURES			FEDERALLY FINANCED R&D EXPENDITURES		
	1974	1973	1972	1974	1973	1972
51	18,395	17,963	18,164C	14,985	15,154	13,869
52 LA ST U BATON ROUGE	17,939	16,568	15,399	3,585	4,833	5,083
53 IOWA ST U OF SCI & TECH	17,915	16,525	15,348	6,295	6,178	5,539
54 NORTHWESTERN UNIVERSITY	17,277	16,261	18,284	13,105	12,809	11,603
55 UNIVERSITY OF IOWA	17,178	15,386	14,792	15,057	13,853	11,902
56 BAYLOR COLLEGE OF MED	17,172	15,134	13,056	15,650	13,235	11,560
57 TEMPLE UNIVERSITY	16,164	11,732	15,244	10,792	7,190	8,492
58 UNIVERSITY OF CONNECTICUT	15,502	16,381	15,419E	7,350	7,618	7,772E
59 WASHINGTON STATE UNIV	15,177	15,402	16,174	4,236	4,559	4,478
60 UNIV OF NEBRASKA - LNCLN	15,161	13,970	15,907	3,589	3,990	4,038
TOTAL 1ST 60 INSTS.	2,044,137	2,018,466	1,844,014	1,392,286	1,420,649	1,276,685
61 U OF CAL RIVERSIDE	15,106	13,960	10,759	6,257	5,606	4,478
62 VIRGINIA POLYTECHNIC INST	15,012	13,380	11,564	5,360	5,189	4,366
63 UNIVERSITY OF CINCINNATI	14,950	12,142	11,871	6,845	6,903	6,325
64 CARNEGIE-MELLON UNIV	14,880	14,850	13,211	8,736	8,783	8,528
65 U OF TEX M D ANDERSON HOS	14,706	13,264	10,797	9,255	7,962	6,848
66 SUNY BUFFALO	14,648	13,068	10,738	13,358	8,139	8,270
67 MISSISSIPPI STATE UNIV	14,506	11,113	10,423	4,639	4,216	3,810
68 WOODS HOLE OCNGRPHIC INST	14,468	14,342	12,701	12,992	13,370	11,994
69 UNIV ALABAMA BIRMINGHAM	14,332	11,588	9,867	13,230	10,729	8,838
70 UNIV OF MASS AT AMHERST	14,197	9,180	7,752	7,852	6,719	5,312
TOTAL 1ST 70 INSTS.	2,190,942	2,145,353	1,953,697	1,480,810	1,498,265	1,345,454
71 GEORGIA INSTITUTE OF TECH	14,133	12,263	12,016	6,904	6,111	5,893
72 UNIVERSITY OF PITTSBURGH	14,098	15,048	15,016	11,728	13,074	12,788
73 VANDERBILT UNIVERSITY	13,659	13,683	12,681	11,817	11,780	10,736
74 KANSAS ST UNIVERSITY	13,352	12,457	11,453	5,591	5,517	5,462
75 OKLAHOMA STATE UNIVERSITY	13,297	13,416	13,213	5,301	6,122	5,741
76 UNIVERSITY OF VIRGINIA	13,005	11,027	9,925	9,437	8,425	7,503
77 UNIV OF KENTUCKY ALL CAM	12,781	12,594	11,559	5,745	6,248	6,123
78 GEORGE WASHINGTON UNIV	12,577	12,150	10,749	11,264	10,810	9,108
79 CUNY MT SINAI SCH OF MED	12,352	11,785	11,828	8,740	8,055	7,945
80 BOSTON UNIVERSITY	12,348	9,237	8,012	10,648	8,407	7,225
TOTAL 1ST 80 INSTS.	2,322,244	2,269,013	2,070,149	1,567,985	1,582,814	1,423,978
81 FLORIDA STATE UNIVERSITY	11,769	11,324	11,324	8,999	8,695	8,695
82 UTAH STATE UNIVERSITY	11,529	9,837	9,243	7,921	7,594	6,361
83 TULANE UNIVERSITY	11,315	12,392	10,333E	7,276	7,983	5,992E
84 AUBURN UNIVERSITY	10,424	9,464	8,912	3,821	4,078	3,574
85 UNIVERSITY OF IDAHO	10,021	8,572	7,881	4,306	3,759	3,530
86 U PUERTO RICO MAYAGUEZ	9,425	8,482E	7,634E	3,147	2,832E	2,549E
87 SUNY UPSTATE MEDICAL CTR	9,264	9,486	6,907	6,051	6,720	5,509
88 SUNY STONY BROOK	8,910	8,540	7,142	7,324	6,837	6,252
89 GEORGETOWN UNIVERSITY	8,876	7,771	5,465E	4,792	5,026	4,674
90 EMORY UNIVERSITY	8,844	8,232	7,739	7,514	7,141	6,817
TOTAL 1ST 90 INSTS.	2,422,621	2,363,113	2,152,729	1,629,136	1,643,479	1,477,931
91 INDIANA UNIV-BLOOMINGTON	8,678	9,214	9,258	7,200	7,744	7,799
92 U OF CAL IRVINE	8,619	6,776	5,029	7,427	5,949	4,376
93 BROWN UNIVERSITY	8,520	9,075	12,736	7,954	8,537	8,875
94 UNIVERSITY OF ARKANSAS	8,422	7,638	9,192	2,306	2,811	4,312
95 CLEMSON UNIVERSITY	8,288	6,744	5,992	2,572	2,260	2,360
96 INDIANA UNIVERSITY-PURDUE	8,168	7,965	7,396	5,665	5,714	4,783
97 NEW MEXICO STATE UNIV	7,986	6,849	12,899	7,249	6,257	12,437
98 UNIV OF MD BALTIMORE	7,981	6,312	6,270	6,724	5,695	5,747
99 UNIV OF VT & ST AGRIC COL	7,786	7,188	6,384	5,127	4,761	4,696
100 U TEX GALVESTON MED BRAN	7,649	6,534	5,345	4,430	4,224	3,705
TOTAL 1ST 100 INSTS.	2,504,718	2,437,908	2,233,230	1,685,790	1,697,431	1,537,021

SEE FOOTNOTE AT END OF TABLE.

TABLE B-16. CONTINUED — TOTAL AND FEDERALLY FINANCED EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY INSTITUTION: FISCAL YEARS 1972-74

(DOLLARS IN THOUSANDS)

INSTITUTIONS RANKED BY TOTAL R&D EXPENDITURES (1974)	TOTAL R&D EXPENDITURES			FEDERALLY FINANCED R&D EXPENDITURES		
	1974	1973	1972	1974	1973	1972
101 TUFTS UNIVERSITY	7,647	7,456	7,489	6,280	6,393	6,475
102 UNIVERSITY OF DENVER	7,604	6,611	6,323	5,425	5,437	5,223
103 SUNY DOWNSTATE MED CTR	7,535	5,568	4,960	6,001	4,126	3,709
104 UNIVERSITY OF OREGON	7,276	6,697	5,778	6,975	6,361	5,003
105 WAYNE STATE UNIVERSITY	7,168	6,386	4,805	4,450	3,741	3,148
106 UNIVERSITY OF WYOMING	7,157	6,678	5,660	4,626	4,531	3,510
107 UNIVERSITY OF NEW MEXICO	7,095	7,093	5,537	5,632	5,093	4,398
108 U TEX HLTH SCI CTR DALLAS	6,969	6,258	5,484	5,349	4,941	4,379
109 VIRGINIA COMMONWLTH UNIV	6,871	6,850	5,718	5,152	5,282	4,082
110 UNIV OF MAINE ORONO	6,824E	6,438	5,769	4,436E	4,307	3,118
TOTAL 1ST 110 INSTS.	2,576,864	2,503,923	2,290,753	1,740,116	1,747,643	1,580,066
111 WEST VIRGINIA UNIVERSITY	6,820	6,851	8,721E	4,225	4,736	6,123E
112 BRANDEIS UNIVERSITY	6,747	6,601	6,443E	6,057	5,814	5,658E
113 UNIVERSITY OF DAYTON	6,333	6,395	5,623	6,080	6,067	5,281
114 UNIVERSITY OF DELAWARE	6,333	5,760	4,934	3,566	3,500	3,158
115 RICE UNIVERSITY	6,297	5,927	5,637	5,122	4,971	4,878
116 U OF ILL MEDICAL CENTER	6,224	6,554	6,857	3,999	4,330	4,373
117 U TENN MED UNITS MEMPHIS	6,142	7,081	4,970	5,198	6,001	4,174
118 MONTANA STATE UNIVERSITY	6,130	6,692	4,963	2,314	2,450	2,220
119 UNIV OF MISSISSIPPI	6,073	6,276	5,010E	3,603	3,865	3,344E
120 SYRACUSE UNIVERSITY	6,020	11,988	7,250E	5,017	10,233	6,000E
TOTAL 1ST 120 INSTS.	2,639,995	2,574,050	2,351,211	1,785,302	1,799,610	1,625,275
121 ALBANY MED COL OF UNION U	5,980	6,598	5,831	3,139	3,127	2,626
122 U OF OREGON MED SCHOOL	5,753	6,036E	5,487	4,707	4,571E	4,155
123 ST LOUIS UNIV	5,704	5,548	5,725	4,943	4,771	4,721
124 NORTH DAKOTA STATE UNIV	5,602	5,263	4,728	1,514	1,480	1,341
125 NEW YORK MEDICAL COLLEGE	5,473	4,615	4,695	4,274	3,550	3,032
126 THOM JEFFERSON UNIV HOSP	5,460	4,847	3,881	4,215	3,873	2,826
127 THE MED COLL OF WISCONSIN	5,386	5,066	3,862	3,432	3,372	2,275
128 UNIV OF RHODE ISLAND	5,187	4,940E	4,705E	4,166	3,968E	3,779E
129 MEDICAL COLL OF GEORGIA	5,036	3,924	2,672	2,449	2,762	1,570
130 RENSSELAER POLY INST	5,030E	5,382E	4,893	4,482E	4,796E	4,360
TOTAL 1ST 130 INSTS.	2,694,594	2,626,269	2,397,690	1,822,623	1,835,880	1,655,960
131 UNIVERSITY OF NOTRE DAME	5,011	4,527	4,373	4,428	4,096	4,053
132 UNIV OKLAHOMA	4,991	5,937E	5,478E	4,209	4,797E	4,505E
133 U TENNESSEE KNOXVILLE	4,898	4,067	3,279	4,232	3,555	2,621
134 INDIANA UNIV NORTHWEST	4,847	5,082	3,375	4,845	5,077	3,282
135 LEHIGH UNIVERSITY	4,823	4,654	5,610	3,179	3,274	3,567
136 U TENN INST OF AGRICULT	4,788	4,407	4,109	2,078	2,018	1,924
137 U OF CAL SANTA BARBARA	4,770	4,939	4,578	3,857	4,146	4,010
138 RUSH MEDICAL COLLEGE	4,759	4,485	3,785E	3,762	2,792	2,062E
139 UNIV OF MO SYSTEM OFC	4,758	4,706	6,900	1,872	2,368	2,903
140 UNIV OF MISSOURI ROLLA	4,649	4,059	4,565	2,255	2,200	2,593
TOTAL 1ST 140 INSTS.	2,742,888	2,673,132	2,443,742	1,857,340	1,870,203	1,687,480
141 U TEX MED SCH HOUSTON	4,625	3,812	386	3,909	2,884	381
142 SOUTH DAKOTA STATE UNIV	4,527	4,472	4,570	1,607	1,596	1,729
143 U OF NEB MED C AT OHAMA	4,518	3,706E	3,369	3,338	2,984E	2,713
144 COL OF MED & DENT OF N J	4,328	3,457	2,295	3,294	2,902	1,769
145 HOWARD UNIVERSITY	4,216	3,680E	3,672E	3,680	2,863E	2,857E
146 UNIV OF NEVADA - RENO	4,114	3,049	1,952	1,373	1,239	1,242
147 TEXAS TECH UNIVERSITY	4,084	4,037	4,093	935	938	877
148 S U N Y SYSTEM OFFICE	3,786E	3,572	3,215E	2,896E	2,812	2,240E
149 POLYTECHNIC INST OF N Y	3,761	3,239	2,845	3,453	3,012	2,582
150 U OF WIS MILWAUKEE	3,760	3,665	3,187	1,190	1,149	1,036
TOTAL 1ST 150 INSTS.	2,784,607	2,709,821	2,473,326	1,883,015	1,892,582	1,704,906

SEE FOOTNOTE AT END OF TABLE.

TABLE B-16.
CONTINUED

TOTAL AND FEDERALLY FINANCED EXPENDITURES IN UNIVERSITIES AND COLLEGES, BY INSTITUTION: FISCAL YEARS 1972-74

(DOLLARS IN THOUSANDS)

INSTITUTIONS RANKED BY TOTAL R&D EXPENDITURES (1974)	TOTAL R&D EXPENDITURES			FEDERALLY FINANCED R&D EXPENDITURES		
	1974	1973	1972	1974	1973	1972
151 DARTMOUTH COLLEGE	3,726	4,918	4,565	3,371	4,501	4,046
152 UNIV OF NEW HAMPSHIRE	3,547	3,856	3,094	2,487	2,846	2,602
153 LA ST U MED CTR N ORLEANS	3,532	3,231	2,447	2,580	2,060	1,739
154 SUNY ALBANY	3,497	3,686	5,165	2,767	2,935	3,673
155 U TEX HLTH SCI CR SAN ANT	3,494	3,285	1,530	2,753	2,599	1,080
156 STEVENS INSTITUTE OF TECH	3,472	3,498	3,424	2,113	2,220	2,218
157 UNIVERSITY OF HOUSTON	3,387	3,044	2,156	2,728	2,436	1,714
158 UNIVERSITY OF LOUISVILLE	3,324	2,751	2,369	2,280	1,887	1,802
159 BOSTON COLLEGE	3,280	4,182E	3,802	1,967	2,552E	2,320
160 MICHIGAN TECH UNIVERSITY	3,244	2,207	1,948	925	460	393
TOTAL 1ST 160 INSTS.	2,819,110	2,744,479	2,503,826	1,906,986	1,917,078	1,726,493
161 U OF NEV DESERT RES INST	3,210	3,239	4,000E	1,562	2,216	2,000E
162	3,093	3,255E	3,658C	2,453	2,638E	3,151C
163 UNIVERSITY OF MONTANA	3,040	2,764E	1,497	1,709	1,554E	720
164 U OF CAL SANTA CRUZ	3,015	2,769	2,711	1,871	1,715	1,911
165 SAN DIEGO STATE UNIV	2,966	2,842	2,522	2,377	2,272	2,025
166 MED UNIV OF SO CAROLINA	2,948	2,305	2,084	2,346	1,739	1,645
167 FLORIDA ATLANTIC UNIV	2,908	2,754	1,186E	456	524	801E
168 HAHNEMAN MEDICAL COLLEGE	2,902	3,111	3,330	2,257	2,517	2,113
169	2,846	2,836C	2,474C	2,362	2,381	2,149C
170 N MEX INST MINING & TECH	2,695	2,534	2,387	1,618	1,460E	1,338
TOTAL 1ST 170 INSTS.	2,848,733	2,772,868	2,529,675	1,925,997	1,936,094	1,744,346
171 BRIGHAM YOUNG UNIVERSITY	2,656	2,698E	2,453	1,599	1,368E	1,244
172 ARIZONA STATE UNIVERSITY	2,617	2,242	1,919	1,395	1,345	1,224
173 US NAVAL POSTGRAD SCHOOL	2,601	2,925	1,934	2,601	2,925	1,934
174 DREXEL UNIVERSITY	2,466	2,358E	1,609E	1,638	1,904E	1,471E
175 CATHOLIC UNIV OF AMERICA	2,462	2,488	2,393	2,092	2,155	2,040
176 SOUTHERN ILLINOIS UNIV	2,439	2,754	3,246	654	580	642
177 SUNY COL OF ENV SCI & FOR	2,362	2,808	2,290	880	899	671
178 CUNY GRADUATE DIVISION	2,301	1,567	815E	1,480	991	550E
179 ILLINOIS INST OF TECH	2,277	2,834	3,072	2,038	2,571	2,831
180 U OF ARKANSAS MED CENTER	2,258	2,249	2,051	1,654	1,766	1,802
TOTAL 1ST 180 INSTS.	2,873,172	2,797,811	2,551,457	1,942,028	1,952,598	1,758,755
181 UNIV OF SOUTH CAROLINA	2,245	1,841	1,657E	962	792	713E
182 U OF CAL UNIV-WIDE PRGMS	2,139	1,991	1,716	72	50	35
183 GEO PEABODY COL TEACHERS	2,110	2,490E	1,310E	2,040	2,420E	668E
184 UNIV OF SOUTH FLORIDA	2,106	1,956	1,178	1,084	1,087	787
185 AMERICAN UNIVERSITY THE	2,105	2,143	2,128	2,059	2,112	2,057
186 SUNY COLLEGE BROCKPORT	2,090	1,985	1,896	1,366	1,465	1,422
187 INSTITUTE PAPER CHEMISTRY	2,045	1,970	2,081	169	93	121
188 UNIV OF ILL CHICAGO CIR	2,021	1,775	1,564	1,828	1,380	1,260
189 OLD DOMINION UNIVERSITY	1,979	1,829	990	1,740	1,234	935
190 U PUERTO RICO MED SCI CMP	1,963	1,767E	1,590E	1,579	1,419E	1,277E
TOTAL 1ST 190 INSTS.	2,893,977	2,817,558	2,567,567	1,954,947	1,964,650	1,768,230
191 CUNY CITY COLLEGE	1,943I	1,833E	1,666E	1,426I	1,384E	1,247E
192 UNIV OF NORTH DAKOTA	1,890	1,400	1,126	1,580	1,023	750
193 ADELPHI UNIV	1,884	2,134	1,700E	1,568	1,814	1,385E
194 MEHARRY MEDICAL COLLEGE	1,808I	1,903E	1,730E	1,665I	1,790E	1,627E
195 UNIV OF SOUTH ALABAMA	1,761	985	530	1,239	774	506
196 U OF MO K C	1,731	[illegible]7	4,346	1,172	1,592	2,383
197 LOYOLA UNIVERSITY	1,625	[illegible]6	1,399	1,433	1,175	1,142
198 THE MED COLL OF PENNA	1,611	[illegible]13	992	1,068	1,081	758
199 SOUTHERN METHODIST UNIV	1,530	1,910	1,328	1,064	1,518	1,044
200	1,489	1,308	1,409C	1,078	866	756
TOTAL 1ST 200 INSTS.	2,911,249	2,834,027	2,583,793	1,968,240	1,977,667	1,779,828
ALL OTHER INSTITUTIONS	106,142	102,680	92,718	65,235	63,828	59,105

a/ Excludes Draper Laboratory with $55 million in R&D expenditures. This institution is classified as part of the independent nonprofit sector in 1974.

NOTE: Numbers followed by the letter "E" are estimates; those followed by "I" are imputations, and "C" are confidential.

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-32.

TOTAL AND FEDERALLY FINANCED CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE FOR SELECTED YEARS: FISCAL YEARS 1964-74

(DOLLARS IN THOUSANDS)

FIELD	1964	1966	1968	1970	1972	1973	1974
TOTAL	$529,492	$666,997	$1,070,727	$951,873	$914,844	$840,254	$837,334
ENGINEERING	71,699	95,119	126,304	132,623	87,307	57,955	90,715
PHYSICAL SCIENCES	130,700	182,678	283,811	225,268	164,518	108,744	89,450
ENVIRONMENTAL SCIENCES	(a)	(a)	(a)	(a)	(a)	26,389	24,022
MATHEMATICAL SCIENCES	22,792	31,856	55,104	38,160	24,712	20,062	23,708
LIFE SCIENCES	231,993	276,328	452,707	418,472	517,941	488,797	494,845
PSYCHOLOGY	21,720	19,734	34,425	22,036	19,007	39,574	15,606
SOCIAL SCIENCES	32,588	44,928	76,217	62,049	59,993	61,198	59,478
OTHER SCIENCES, NEC	18,000	16,354	42,159	53,265	41,366	37,535	39,510
FEDERALLY FINANCED							
TOTAL	134,439	212,397	340,447	279,316	239,193	226,672	227,694
ENGINEERING	10,946	25,049	39,432	38,263	23,439	15,751	42,283
PHYSICAL SCIENCES	29,701	67,300	95,178	63,107	36,378	24,453	20,880
ENVIRONMENTAL SCIENCES	(a)	(a)	(a)	(a)	(a)	5,799	7,023
MATHEMATICAL SCIENCES	4,052	11,469	13,676	9,536	4,341	3,020	4,291
LIFE SCIENCES	81,659	90,173	150,591	142,718	152,328	161,945	140,768
PSYCHOLOGY	2,121	4,310	10,342	4,848	3,663	5,115	2,596
SOCIAL SCIENCES	2,020	7,892	17,627	10,303	10,939	5,371	4,514
OTHER SCIENCES, NEC	3,940	6,204	13,601	10,541	8,105	5,218	5,239
OTHER SOURCES							
TOTAL	395,053	454,600	730,280	672,557	675,651	613,582	609,640
ENGINEERING	60,753	70,070	86,872	94,360	63,868	42,204	48,432
PHYSICAL SCIENCES	100,999	115,378	188,633	162,161	128,140	84,291	68,570
ENVIRONMENTAL SCIENCES	(a)	(a)	(a)	(a)	(a)	20,590	16,999
MATHEMATICAL SCIENCES	18,740	20,387	41,428	28,624	20,371	17,042	19,417
LIFE SCIENCES	150,334	186,155	302,116	275,754	365,613	326,852	354,077
PSYCHOLOGY	19,599	15,424	24,083	17,188	15,344	34,459	13,010
SOCIAL SCIENCES	30,568	37,036	58,590	51,746	49,054	55,827	54,864
OTHER SCIENCES, NEC	14,060	10,150	28,558	42,724	33,261	32,317	34,271

a/ Not separately available, included in physical sciences.

SOURCE: NATIONAL SCIENCE FOUNDATION

NSF FORM 411

OMB No. 099-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC ACTIVITIES OF INSTITUTIONS OF HIGHER EDUCATION

(Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering, FY 1974)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This from should be returned by **October 31, 1974.** Your cooperation in returning the survey questionnaires promptly is very important and will be appreciated.

Financial data are requested for the fiscal year which began on July 1, 1973, and ended on June 30, 1974, or your institution's equivalent fiscal year.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where the exact data are not available, estimates are acceptable. Please complete all items; estimates by colleges officials will be better than NSF estimates. Enter "O" as an item total (lines 1100, 1400, 1500, etc., are item totals) rather than leave the total blank.

Please indiate in a separate letter the *number* of any item that should *not* be published with your institution identified.

Name and address of institution:
(Please correct if name or address has changed)

(Includes aggregate data from 603 universities and colleges but excludes 22 university-administered FFRDC'S)

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. **Exclude** data for Federally Funded R&D Centers administered by universities. A list of these Centers is shown below. A separate questionnaire will be mailed directly to each Center.

If you have any questions, please contact Ronald Biggar (202-282-7790).

Highest degree granted in the sciences or engineering by your institution during academic year 1973-74:

Highest Degree Granted:	Check One:	Give example of science field:
Ph.D. or Sc.D.	☐	
M.D., D.D.S., etc.	☐	
Master's	☐	
Bachelor's or the equivalent	☐	
None in sciences or engineering	☐	
2-year program	☐	

Federally Funded Research and Development Centers Administered by Universities and Colleges

Ames Laboratory
Applied Physics Laboratory
Argonne National Laboratory
Brookhaven National Laboratory
Center for Naval Analysis
Cerro Tololo Inter-American Obs.
E. O. Lawrence Berkeley Lab.
E. O. Lawrence Livermore Lab.
Jet Propulsion Laboratory
Kitt Peak National Observatory
Lincoln Laboratory
Los Alamos Scientific Laboratory
National Accelerator Laboratory
National Astronomy and Ionosphere Ctr.
National Center for Atmospheric Res.
National Radio Astronomy Observatory
Oak Ridge Associated Universities
Ordnance Research Laboratory
Plasma Physics Laboratory
Space Radiation Effects Laboratory
Stanford Linear Accelerator Center

Name of person submitting this form	Title and telephone
Name of person who prepared this submission (if different from above)	Title and telephone
NAME OF INSTITUTION / Date	ADDRESS (number, street, city, State, zip code)

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND TYPE OF ACTIVITY, 1973-74 (Include indirect costs)

If your institution did not have any current expenditures for separately budgeted research and development in 1973-74 check "none" in the space provided here. ☐None

Go to Item 3 for questions pertaining to instruction and departmental research and Item 4 for capital equipment and facility expenditures.

Source of Funds		(1) Total R&D Expenditures (Thousands of dollars)	(2) Basic research (Percent of Column One)	(3) Applied Research (Percent of Column One)	(4) Development (Percent of Column One)
a. Federal Government	1110	$ 2,033,475	74.9 %	21.6 %	3.5 %
b. State Government	1120	315,329			
c. Local Government	1130	14,042			
d. Foundations and Voluntary Health Agencies	1140	142,648			
e. Industry	1150	96,033			
f. Institution's Own Funds	1160	339,903			
g. Other Sources	1170	75,961			
h. Total (sum of a to g)	**1100**	$ 3,017,391	71.2 %	24.6 %	4.2 %

Basic research is directed toward an increase of knowledge; it is research where the primary aim of the *investigator* is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.

Applied research is directed toward the practical application of knowledge. The definition of applied research differs from basic research chiefly in terms of the objectives of the *investigator*.

Development is the systematic use of knowledge directed toward the design and production of useful prototypes, materials, devises, systems, methods, or processes. It does *not* nclude quality control or routine product testing.

ITEM 1. GENERAL INSTRUCTIONS

Source of funds refers to immediate sources rather than original sources of funds. For example, funds received from a foundation should be reported under that source, even if industry was the original source of some or all of the foundation's funds.

Exclude R&D contracts subcontracted by your institution to be performed by other ogranizations.

Include indirect costs incurred in carrying out R&D programs (e.g. such costs as plant maintenance, executive management, libraries). Include all indirect costs defrayed with institution's own funds in addition to those reimbursed or reimbursable by the sponsoring organization.

1a—Federal Government
—include grants and contracts earmarked for research and development by all agencies of the Federal Government.

1b—State Government
—include funds designated for R&D by State governments and their agencies. Include restricted funds supporting research and development at agricultural experiment stations.

1c—Local Government
—include funds designated for R&D by county, municipal, or other local governments and their agencies.

1d—Foundations & Voluntary Health Agencies
—the following funding sources should not be reported in Item 1d; instead report them as noted:
a) Funds from foundations which are affiliated with or grant soley to your institution should be reported in 1f.
b) Funds derived from State or local government health agencies should be reported in 1b or 1c.
c) Funds from professional societies such as the American Medical Association should be reported in 1g.

1e—Industry
—include all grants and contracts earmarked for R&D by profitmaking organizations, whether engaged in production, distribution, research, service, or other activities.

1f—Institution's Own Funds
—include any funds your institution was free to designate for R&D. The sources of these funds may include:
a) Endowment income
b) Tuition and fees
c) Unrestricted State or local government appropriations
d) General-purpose grants from industry, foundations, or other outside sources, provided these were unrestricted funds.
e) Indirect costs on separately budgeted projects funded by your institution as well as unreimbursable indirect costs associated with R&D financed by outside organizations.

1g—Other Sources
—report any additional funds received from outside sources other than those already noted, and which were earmarked for R&D *by the source*. Examples include gifts, grants, or contracts received from private individuals or professional societies, and designated for R&D by them.

ITEM 2. TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, 1973-74

Field of Science	Illustrative Disciplines		Thousands of dollars	
			Total	Federal
a. **ENGINEERING**	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio-and-biomedical, energy, textile, architecture	1410	$ 346,292	$ 239,551
b. **PHYSICAL SCIENCES (TOTAL)**		1420	339,435	271,449
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421	24,840	17,385
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422	117,479	88,414
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423	173,232	148,187
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424	23,884	17,463
c. **ENVIRONMENTAL SCIENCES**	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430	231,138	166,088
d. **MATHEMATICAL SCIENCES (TOTAL)**		1440	77,026	57,754
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441	37,822	29,309
(2) Computer Sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442	39,204	28,445
e. **LIFE SCIENCES (TOTAL)**		1450	1,616,337	1,053,039
(1) Biological Sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, paracitology, pathology, pharmacology, physical anthropology, physiology, botony, zoology	1451	525,877	370,781
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452	323,364	99,892
(3) Clinical Medical	Anesthesiology, cardiology, endoctrinology, gastroenterology, hematology, neurology, obstetrics, ophthamology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453	709,395	540,111
(4) Other	Used for multidisciplinary projects within life sciences	1454	57,701	42,255
f. **PSYCHOLOGY**	Animal behavior, clinical, educational, experimental, human development and personality, social	1460	75,415	58,552
g. **SOCIAL SCIENCES (TOTAL)**		1470	245,317	135,923
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471	49,303	22,413
(2) Political Science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472	26,970	11,345
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473	64,878	41,252
(4) Other	History, cultural anthropology, linguistics, socio-economic geography, research in education	1474	104,166	60,913
h. **OTHER SCIENCES**	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible, do *not* include nonscience activities such as English or music in this survey	1480	86,431	51,119
i. **TOTAL (SUM of a to h)** Check to insure that column totals are identical with data reported in item 1.		1400	3,017,391	2,033,475

ITEM 3. CURRENT EXPENDITURES FOR INSTRUCTION AND DEPARTMENTAL RESEARCH IN THE SCIENCES AND ENGINEERING, BY FIELD OF SCIENCE, 1973-74 (Direct expenditures only)

Field of Science		Total Instruction and Departmental Research (Thousands of dollars) (1)	Departmental Research as a Percent of Col. 1 (2)
a. Engineering	1510	$ 413,851	10.2 %
b. Physical sciences	1520	399,688	11.6 %
c. Environmental sciences	1530	110,979	11.3 %
d. Mathematical sciences	1540	267,365	10.6 %
e. Life sciences	1550	1,521,819	11.9 %
f. Psychology	1560	186,007	10.1 %
g. Social sciences	1570	830,202	10.5 %
h. Other sciences, NEC	1580	153,864	8.0 %
I. Total (sum of a to h)	**1500**	$ 3,883,775	a/ 11.0 %

INSTRUCTIONS

In column 1, include the salaries of department heads, faculty members, secretaries and technicians; office and laboratory supplies; and expenditures for degree credit instructional programs in *science and engineering* subjects.

In column 2, *departmental research* means research activities that are not separately budgeted and accounted for. Percentage estimates may be based on consultations with department chairman or estimated from central records. If central records are used, take the proportion of time spent by faculty on instruction, organized research, public service, and administration—the residual should yield departmental research. Faculty activity reports may also be used as a basis for estimating departmental research.

Note: The time spent in supervising the thesis work of graduate students should be reported as an expenditure for instruction, not for departmental research. *If no departmental research is performed by your organization, please report zero in column 2.*

ITEM 4. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE, 1973-74

Field of Science		Thousands of Dollars		
		Total (1)	Federal Government (2)	All Other Sources (3)
a. Engineering	1710	$ 90,715	$ 42,283	$ 48,432
b. Physical sciences	1720	89,450	20,880	68,570
c. Environmental sciences	1730	24,022	7,023	16,999
d. Mathematical sciences	1740	23,708	4,291	19,417
e. Life sciences	1750	494,845	140,768	354,077
f. Psychology	1760	15,606	2,596	13,010
g. Social sciences	1770	59,478	4,614	54,864
h. Other sciences, NEC	1780	39,510	5,239	34,271
I. Total (sum of a to h)	**1700**	$ 837,334	$ 227,694	$ 609,640

INSTRUCTIONS

Report funds for facilities which were in process or completed during 1973-74. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be excluded. Exclude small equipment items in your current fund account costing approximately $200 to $500 or less, as determined by institutional policy.

Facilities and equipment expenditures include the following: (a) fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscillosopes, pulse-height analyzers; (c) movable furnishings such as desks; (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

a/ Graduate Degree Granting Institutions in the Sciences and Engineering.

APPENDIX C

List of Federally Funded Research and Development Centers Administered by Universities and University Consortia[1]

DEPARTMENT OF DEFENSE

Department of the Navy
Applied Physics Laboratory (Johns Hopkins University).
Applied Research Laboratory (Pennsylvania State University).
Center for Naval Analyses (University of Rochester).

Department of the Air Force
Lincoln Laboratory (Massachusetts Institute of Technology).

ATOMIC ENERGY COMMISSION

Ames Laboratory (Iowa State University of Science and Technology).
Argonne National Laboratory (University of Chicago and Argonne Universities Association).
Brookhaven National Laboratory (Associated Universities, Inc.).
Cambridge Electron Accelerator (Harvard University and Massachusetts Institute of Technology).
Lawrence Radiation Laboratory, Berkeley and Livermore (University of California).
Los Alamos Scientific Laboratory (University of California).
Fermi National Accelerator Laboratory (Universities Research Association).
Oak Ridge Associated Universities.
Plasma Physics Laboratory (Princeton University).
Stanford Linear Accelerator Center (Stanford University).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Jet Propulsion Laboratory (California Institute of Technology).
Space Radiation Effects Laboratory (College of William and Mary).

NATIONAL SCIENCE FOUNDATION

Cerro-Tololo Inter-American Observatory (Association of Universities for Research in Astronomy, Inc.).
National Astronomy and Ionosphere Center (Cornell University).
Kitt Peak National Observatory (Association of Universities for Research in Astronomy, Inc.).
National Center for Atmospheric Research (University Corporation for Atmospheric Research).
National Radio Astronomy Observatory (Associated Universities, Inc.).

[1] All of the organizations listed here were designated by the Federal Council for Science and Technology to be FFRDC's in fiscal year 1973-74.

Statistical Tables

University-Administered Federally Funded Research and Development Centers (Part II)

C-1. Current R&D expenditures in university-administered Federally Funded Research and Development Centers, by character of work, and field of science, for selected years: FY 1964-74 47
C-2. Federally financed current R&D expenditures in university-administered Federally Funded Research and Development Centers, by character of work, and field of science, for selected years: FY 1964-74 .....
C-3. Current R&D expenditures in university-administered Federally Funded Research and Development Centers, by character of work, FY 1953-74 .....
C-4. Selected financial characteristics of scientific activities in university-administered Federally Funded Research and Development Centers, FY 1974 .....
C-5. Current R&D expenditures in university-administered Federally Funded Research and Development Centers, in descending order of amounts, by field of science, FY 1974 .....

TABLE C-1. CURRENT R&D EXPENDITURES IN UNIVERSITY-ADMINISTERED FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS, BY CHARACTER OF WORK, FIELD OF SCIENCE, FOR SELECTED YEARS: FISCAL YEARS 1964-74

(DOLLARS IN THOUSANDS)

CHARACTER AND FIELD	1964	1966	1968	1970	1972	1973	1974
TOTAL	$629,207	$629,502	$718,930	$736,847	$763,563	$816,923	$865,098
CHARACTER OF WORK:							
BASIC RESEARCH	191,027	226,547	275,595	268,732	250,167	296,492	299,813
APPLIED RESEARCH	201,800	207,012	231,207	215,587	225,452	226,376	267,145
DEVELOPMENT	236,380	195,943	212,128	252,528	287,944	294,055	298,140
FIELD OF SCIENCE:							
ENGINEERING (TOTAL)	154,704	150,522	178,945	189,060	198,070	251,539	260,958
PHYSICAL SCIENCES (TOTAL)	362,352	368,485	410,362	428,189	431,864	425,107	456,647
ASTRONOMY	24,599	20,114	27,330	19,765	28,473	28,055	29,944
CHEMISTRY	59,458	51,941	61,718	71,229	75,395	73,114	77,742
PHYSICS	264,632	285,306	306,294	317,549	309,266	318,002	345,401
OTHER PHYSICAL SCIENCES NEC	13,633	11,124	15,020	19,646	18,730	5,936	3,560
ENVIRONMENTAL SCIENCES (TOTAL)	28,310	31,173	27,875	26,970	37,186	40,647	44,069
MATHEMATICAL SCIENCES (TOTAL)	39,850	40,019	37,147	38,213	41,738	53,178	53,517
MATHEMATICS (EXCLUDING COMPUTER SCIENCES)	NA	NA	NA	NA	NA	14,744	16,002
COMPUTER SCIENCES	NA	NA	NA	NA	NA	38,434	37,515
LIFE SCIENCES (TOTAL)	37,504	32,136	32,602	34,176	36,346	33,964	36,296
BIOLOGICAL (INCLUDES AGRICULTURAL SCIENCES)	28,528	25,150	26,352	26,804	29,204	24,344	27,245
CLINICAL MEDICAL	8,976	6,986	5,634	6,753	3,707	3,347	4,291
OTHER LIFE SCIENCES, NEC	NA	NA	616	619	3,435	6,273	4,760
PSYCHOLOGY (TOTAL)	4,776	4,195	5,661	1,506	1,447	898	850
SOCIAL SCIENCES (TOTAL)	1,522	2,815	8,945	5,059	8,686	169	330
ECONOMICS	NA	NA	149	20	NA	0	14
POLITICAL SCIENCE	NA	NA	336	220	91	0	0
SOCIOLOGY	NA	NA	604	102	55	169	316
OTHER SOCIAL SCIENCES, NEC	1,522	2,815	7,856	4,717	8,540	0	0
OTHER SCIENCES, NEC (TOTAL)	189	157	17,393	13,674	8,226	11,421	12,431

NOTE: NA - NOT AVAILABLE
SOURCE: NATIONAL SCIENCE FOUNDATION

APPENDIX D

Reproduction of Covering Letter

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550
October 1, 1974

Dear Sir:

The National Science Foundation requests your cooperation in its ninth survey of scientific activities of institutions of higher education. Timely statistics from the survey play a vital part in assessing the overall effectiveness of ongoing Federal R&D efforts to strengthen science and technology in universities and colleges. Your reports will be processed immediately to include the data in (a) the National Science Board's annual report to the President, (b) NSF's "Science Resources Studies Highlights", and (c) NSF's report "National Patterns of R&D Resources".

Please note that the questionnaire has been revised without changing the basic survey concepts. The revision now eliminates the collection of R&D expenditures by major cost item and combines the instructions with each item on the questionnaire. Hopefully, these changes will reduce your reporting burden and thereby enable you to provide even more timely information.

Please complete and return the form to us by October 31, 1974. Early responses are critical to the success of the survey. The postcard included in the package should be returned immediately to assure us that the questionnaire has reached you; also, it will provide the names of persons to be contacted if questions arise in the follow-up and editing phases of the survey.

NSF recognizes that your breakdown of expenditures into basic research, applied research, development, and departmental research requires estimates from "soft" data. NSF will publish only national aggregates for these statistics; therefore, your best estimate is perfectly satisfactory.

A copy of a summary of last year's data is enclosed to point out NSF's efforts to provide early release of statistics. A detailed report will be published shortly. If you would like to have any additional data from the survey listings, such as institutional rankings, please let us know and we will try to provide them to you.

Your continued cooperation in reporting timely data to NSF is greatly appreciated. If you have questions, please address them to me or Mr. Ronald Biggar. We may be reached on Area Code 202, 282-7790.

Sincerely yours,

Richard M. Berry

Richard M. Berry, Study Director
Universities and Nonprofit
Institutions Studies Group
Division of Science Resources Studies

Enclosures

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Other Science Resources Publications

REPORTS	NSF No.	Price
Reviews of Data on Science Resources, No. 26, "Energy and Energy Related R&D Activities of Federal Installations and Federally Funded Research and Development Centers: Estimated Funds and Manpower: Fiscal Years 1973-75"	76-304	In press
Reviews of Data on Science Resources, No. 25, "Doctoral Scientists and Engineers in Private Industry: 1973"	76-302	In press
Projections of Degrees and Enrollment in Science and Engineering Fields to 1985	76-301	In press
Characteristics of the National Sample of Scientists and Engineers, 1974. Part I. Demographic and Educational	75-333	$1.90
An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1976	75-330	$1.80
The 1972 Scientist and Engineer Population Redefined. Volume 2. Labor Force and Employment Characteristics	75-327	$2.65
Research and Development in Industry, 1973. Funds, 1973; Scientists & Engineers, Jan. 1974	75-315	$1.95
The 1972 Scientist and Engineer Population Redefined. Volume 1. Demographic, Educational, and Professional Characteristics	75-313	$3.70
Detailed Statistical Tables. Characteristics of Doctoral Scientists and Engineers in the United States, 1973	75-312-A	——
Characteristics of Doctoral Scientists and Engineers in the United States, 1973	75-312	$1.15
Reviews of Data on Science Resources, No. 23, "Work Activities of Employed Doctoral Scientists and Engineers in the U.S. Labor Force, July 1973"	75-310	$0.65
Young and Senior Science and Engineering Faculty, 1974: Support, Research Participation, and Tenure	75-302	$1.70
Projections of Science and Engineering Doctorate Supply and Utilization, 1980 and 1985	75-301	$1.30
HIGHLIGHTS		
"Industrial R&D Expenditures Rise to $22 Billion in 1974"	76-300	——
"National Sample of Scientists and Engineers: Median Annual Salaries, 1974"	75-332	——
"Federal R&D Funding Shows Significant Rise in FY 1976"	75-321	——
"National Sample of Scientists and Engineers: Participation in National Programs and Changes in Educational Attainment, 1972-74"	75-317	——
"Racial Minorities in the Scientist and Engineer Population"	75-314	——
"National Sample of Scientists and Engineers: Changes in Employment, 1970-72 and 1972-74"	75-309	——
"Federal Scientific and Technical Personnel Decline in 1973"	74-316	——
"Immigration of Scientists and Engineers Drops Sharply in FY 1973; Physician Inflow Still Near FY 1972 Peak"	74-302	——